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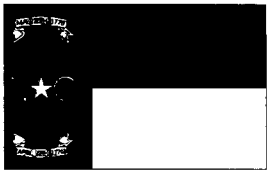

North Carolina

LTPP Specific Pavement Studies

Construction Report on
LTPP 370800,
SPS-8 Project,
Jacksonville, NC, Fall 1997

Report No. FHWA-TS-98-37-02

December 1998

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December 1998

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
FHWA-TS-98-37-02		

4 Title and Subtitle	5. Report Date
LTPP Specific Pavement Studies Construction Report, LTPP 370800, SPS-8 Project, Jacksonville, NC, Summer 1994	December 1998
	6. Performing Organization Code
7. Author(s) Basel Abukhater	8. Performing Organization Report No.
9 Performing Organization Name and Address **Stantec Consulting** 415 Lawrence Bell Drive - Suite 3 Amherst, New York 14221	10 Work Unit No. (TRAIS) 11 Contract or Grant No. DTFH61-96-C-00012
12. Sponsoring Agency Name and Address **Federal Highway Administration** LTPP-Division, HNR-40 Turner-Fairbanks Highway Research Center 6300 Georgetown Pike McLean, Virginia 22101	13 Type of Report and Period Covered 14. Sponsoring Agency Code

15 Supplementary Notes

The report is a cooperative effort between North Carolina Department of Transportation (NCDOT) Research and Development Unit, NCDOT Division of Highways Division 3 District 1, and Stantec Consulting LTPP North Atlantic Region Coordination Office

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16 Abstract

This report provides a description of the construction of an SPS-8 experimental project for the study of the environmental effects of asphalt concrete pavements in the absence of heavy loads conducted as part of the Long Term Pavement Performance (LTPP) program at Jacksonville, North Carolina The construction of three asphalt concrete surface pavement test sections started during the first week of October 1997 and was completed on December 15, 1997 The construction started with the subgrade preparation followed by laying of a dense graded aggregate base layer of different thicknesses, and then, paving using a Dense Type HB Asphalt Concrete Base layer, a Dense Type H Asphalt Concrete Binder layer, and a Dense Type I-2 Asphalt Concrete Surface layer The report contains a description of the non bound pavement layers preparation, the paving operations, the equipment used by the contractor, the field sampling and testing operations during and after construction, problems encountered during construction, specific site circumstances, deviations from the standard guidelines, and a summary of the initial data collection

17 Key Words	18 Distribution Statement		
Monitoring, Survey, FWD, Profilometer			
19 Security Classif (of this report)	20 Security Classif (of this page)	21 No of Pages	22 Price

Form DOT F 1700 7 (8-72) Facsimile

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Construction Report on LTPP 370800, SPS-8 Project, Jacksonville, NC, Fall of 1997

I. Introduction

North Carolina Department of Transportation (NCDOT) SPS-8 project at Jacksonville, NC, is a study of the environmental effects on the performance of asphalt concrete pavements in the absence of heavy loads Table 1 identifies the primary experimental factors of the SPS-8 experiment and their relationships with each other The table also identifies site-related factors across the top and pavement structure parameters down the side Each column represents one project location which incorporates two test sections Each row represents a series of test sections with specific features to be constructed at each project location The NC project lies in the wet no-freeze environmental area with a fine-grained subgrade In addition to the two LTPP test sections of the main experiment, with test section 370801 being a thin structure of 102 mm of asphalt concrete on 203 mm of granular base and test section 370802 being a thick structure of 178 mm of asphalt concrete on 305 mm of granular base, there is one NCDOT (agency design) supplemental section 370859 consisting of 38 mm of asphalt concrete on 152 mm of granular base as shown in Table 2

The project is built on the north bound lane of SR 1245, off SR 1209, Onslow County, 10 km from Albert J Ellis Airport and 30 km from Jacksonville, NC, Figure 1 Figure 2 provides the general location of the SPS-8 experiment and all the other LTPP experiments in NC The three NC SPS-8 test sections are constructed adjacent to each other in series starting at the construction chainage of 6+00 and ending at 31+00 The LTPP station 0+00 of the first section 370801 being at construction station 6+00, and the LTPP station 5+00 of the last section 370859 being at construction station 31+00, Figure 3 Each section is 152 4 meters long and 3 05 meters wide The outside shoulder is paved with a width of 0 61 m

The project was built as part of the State of North Carolina, Department of Transportation, Division 3 District 1 Work Order No 6 262328 - Condition and Pave SR 1245, Onslow County The project was advertised for bids on October 1, 1997 using NCDOT standard contract administration and construction procedures The contract was awarded to Barrus Construction Co , Division of APAC-Carolina, Inc of Kinston, North Carolina on October 16, 1997 for the amount of $103,980 20 The availability date for the beginning of work was Monday October 20, 1997 and the completion date was December 12, 1997

A preliminary planning meeting was held at NCDOT Division 3, District 1 Engineer's office in Jacksonville on Thursday June 5, 1997 The location for building the SPS-8 experiment was agreed upon as well as the pavement structure of the three sections to be constructed A second planning meeting was held at the same office on Friday September 12, 1997 to discuss further details of the SPS-8 construction guidelines and requirements along with the materials sampling and testing plan A final pre bid meeting was held at the same office on Wednesday October 8, 1997 at 1400 hours The meeting was attended by

Barrus Construction Co staff along with NCDOT and the LTPP-NARO representative The meeting was held at the request of NCDOT to clarify mainly the sampling and testing requirements, but various other items were discussed including the Laboratory testing responsibilities of the State Lab and the FHWA Contractor Lab Also the responsibilities on site during construction and the coordination between the LTPP representative and the State and Contractor personnel The FWD testing on the subgrade and aggregate base layer were also emphasized as well as the weather station installation requirements and responsibilities of the different parties Weigh In Motion (WIM) equipment installation was also discussed Appendix A includes all correspondence related to the project nomination, approval, meetings, and contract agreements

On site and in charge of the construction work were Mr Donnie Huffman, District Engineer, Mr Patrick Riddle, Deputy District Engineer, Mr Billy Dixon, County Maintenance Supervisor, and Mr Steven Gurganos, Inspector Dr. Mrinmay "Moy" Biswas, Pavement and Materials Research Engineer, NCDOT Research & Development Unit, arranged for all the Field Testing and Material Sampling on site as well as the laboratory testing. Mr Warren Wethington, from the NCDOT Division 3, District 1 office in Jacksonville, was responsible for all the survey activities on site Mr Bill Wilder of NCDOT was responsible for the nuclear density on the subgrade and Mr Chris Barbee of NCDOT did all the density on the DGAB and AC layers Mr James Bayles and Mr Larry Newsome of NCDOT were responsible for the Split Spoon sampling and the shoulder probes, while the coring of the asphalt concrete layers was performed by Mr Percy Cooke and Mr Glenn Dudley of NCDOT Laboratory testing will be performed by the NCDOT M&T laboratory in Raleigh, NC (LTPP Laboratory Assigned Code 3721) and by the LTPP Contractor laboratory Braun Intertec of Minneapolis, Minnesota (LTPP Laboratory Assigned Code 2711) Samples were also sent to the Materials Reference Library (MRL) in Reno, Nevada for storage

Barrus Construction Co used asphalt from its batch plant, APAC Deppe Plant, located in Deppe, NC and manufactured by Warren Bros , model number W-80, serial number 205-8, with a 4 ton batch size The paving equipment used in the construction included a BLAW-KNOX model PF-180H paver and a CAT CB-534C model double-drum vibratory steel wheel breakdown roller, a Ferguson 8-12B model static final roller, and an Ingersoll-Rand DD-22 model intermediate vibratory roller which was only used on the surface layer The earth works was prepared by the NCDOT Division 3, District 1 Maintenance Unit where a Fiat-Allis 14C Bulldozer and Spreader was used for the DGAB material and a Case roller 602B model number W602BD with a maximum gross weight of 8482 kg was used for compaction of the DGAB and subgrade A John Deere 670B and a Dresser 850 Graders were used for preparing the subgrade layer before placing the DGAB Weather information was recorded manually during construction and an Automated Weather Station (AWS) was installed on March 11, 1998, close to the Cul-De-Sac, at the north end of the project, Figure 4

II. Project Details

Layout

The two main LTPP SPS sections and the NCDOT supplemental section are laid in series starting with the LTPP thin section 370801 at construction station 6+00 followed by the LTPP thick section 370802 starting at construction station 13+00 and finally the NCDOT

thin supplemental section 370859 starting at construction station 26+00 and ending at station 31+00 Table 2 displays the construction station of each section including the sampling areas

Field Materials Sampling and Testing

Locations for field material sampling and testing are summarized in Figure 3 Two main stages of field material sampling and testing were involved here, first, during construction of the subgrade, aggregate base, and asphalt concrete pavement layers, and second, after construction of the final surface layer Table 3 summarizes the field testing on every layer, the number of tests, and the location designation Table 4 summarizes the material sampling for each of the layers, the number of samples collected, and sample location of each Table 5 is intended to show the number, quantity, and location of the bulk samples collected during construction, and to identify those to be used for testing as part of the SPS-8 experiment, and those to be sent to the Materials Reference Library for storage NCDOT did all the field testing, material sampling, and laboratory testing required of the agency Table 6 shows the dates of all the field testing and sampling activities throughout the construction and post construction periods Table 7 lists the actual date as compared to the guidelines on initial monitoring measurements of the SPS-8 sites

The laboratory material testing plan is summarized in Table 8 for the different layers The LTPP test designation and Protocol number for each test is tabulated and so are the number of tests per layer and material source or test location In addition to the NCDOT M&T laboratory in Raleigh, some of the testing, especially the Resilient Modulus, will be performed by the FHWA-LTPP Contractor Laboratory, Braun Intertec of Minneapolis, Minnesota (LTPP Laboratory Assigned Code 2711)

III. Construction

Table 9 lists all the dates of the construction activities for all the sections The subgrade layer of all the sections was ready on October 13, 1997 while the DGAB layer was ready on December 3, 1997 The paving of the asphalt concrete base layer on section 370802 was completed on December 8, the AC binder layer on section 370801 and 370802 was completed on December 11, and the final AC surface layer on all the sections was completed on December 15, 1997 A lot of effort was put into arranging for FWD testing of the final subgrade and DGAB layers so that no delay to the construction activities was caused by this test Barrus Construction Co used an asphalt batch plant for the AC base, binder, and surface layer material

Subgrade Preparation

The subgrade layer was prepared by the NCDOT Division 3, District 1 Maintenance unit A John Deere 670B grader, a Dresser 850 grader, a Case 602B, model number W602BD, maximum gross weight of 8482 kg, were used to prepare and compact the subgrade material The construction of the subgrade layer was completed on October 13, 1997 FWD testing on the subgrade layer of the three sections was conducted on the afternoon of October 13, 1997 When Shelby tube sampling started on October 9, 1997, only 150 mm of fine sand with some silt was obtained Because of the type of material on the top 600 mm of the subgrade, the Shelby tube sampling had to be abandoned and split spoon sampling was conducted instead This was successfully completed on October 10, 1997 Fine sand was found in all the sections with some silt or some clay in some locations

Some wet spots were also encountered. The shoulder auger probes, that are used to check for rock depth, was performed on October 9, 1997 No rock was found but water depth varied from 1 to 2 m in depth along the three shoulder probe locations performed on the shoulder of the three sections. The top 1 m was mainly fine sand and below that was mainly silt and clay with some sand as well.

After finishing the subgrade layer, in-situ densities were measured with the nuclear gage by NCDOT staff at 12 locations, 9 inside the sections and 3 at the bulk sample locations, as indicated in Figure 3 Values of the measured in situ densities and moisture contents are presented in Table 10 Conventional densities were also performed on the final subgrade layer, the values are presented in Table 11 Bulk and moisture subgrade samples were also collected from three locations and elevation shots were taken on October 13, 1997 by the NCDOT Division 3, District 1 staff, on top of the subgrade layer as shown in Figure 5, Elev. 1 and in Figure 6

Dense Graded Aggregate Base Preparation

The dense graded aggregate base course (DGAB) was placed and prepared by the NCDOT Division 3, District 1 Maintenance Unit The material was hauled from Fountain, NC which requires a 3-hour time for a round trip of each truck A Fiat-Allis 14C Bulldozer was used to spread the material and a Case 602B, model number W602BD, maximum gross weight 8482 kg, vibratory roller was used for compaction The construction of this layer started on October 14, 1997 and was completed on October 15, 1997. Section 370801 had 203 mm of DGAB that was laid in two lifts, first lift laid 203 mm and compacted to 152 mm and second lift laid 76 mm and compacted to 51 totaling a compacted 203 mm DGAB layer, section 370802 had 305 mm which was laid in two lifts, first lift laid 203 mm and compacted to 152 mm and second lift laid also 203 mm and compacted to 152 totaling a compacted 305 mm DGAB layer, while section 370859 had 152 mm which was laid in one lift of 203 mm and compacted to a final 152 mm of then DGAB layer The contractor's first task on this project was to condition the DGAB layer prepared by NCDOT before paving When the contractor finished conditioning the existing DGAB, the thickness was found to be 51 mm shy When the additional 51 mm of DGAB was placed, the contractor performed the final grading and reconditioning of the DGAB course which was ready for testing on November 4, 1997 FWD testing on the DGAB layer of the three sections was performed on November 5, 1997 by the NCDOT FWD operated by NCDOT staff with the presence of the LTPP-NARO FWD staff According to the LTPP SPS Testing Protocol P59, the FWD testing should be performed after completion of compaction and fine grading and prior to placement of the next layer Since the paving was delayed till December, another FWD survey was conducted, by the NCDOT FWD operated by NCDOT staff, on December 3, 1997 after final grading of the base layer and prior to placement of the black top In-situ densities were measured on November 4 and 5, 1997 and repeated on December 3, 1997, using the nuclear gage, by NCDOT staff at 12 locations, 9 inside the sections and 3 at the bulk sample locations, as shown in Figure 3 Values of the measured in situ densities and moisture contents are presented in Table 10 Conventional densities were only performed on the final DGAB layer on November 4 and 5, 1997, the values are presented in Table 11 Three bulk and three moisture samples were collected from the sampling areas at locations B4, B5, and B6 prior to final compaction on October 15, 1997 The moisture samples were taken again on November 4 and 5, 1997, and were taken for the third time, just before paving

each of the three sections, on December 8, 11, and 15, 1997 Elevation shots were taken by the NCDOT staff on top of the DGAB layer of all the sections on November 4, 1997 and repeated again prior to paving on December 3 and 4, 1997, Figure 5, Elev 2 and Figure 6 NCDOT decided not to place a prime coat of asphalt emulsion on this layer prior to placing the next AC layer to avoid local cars, trucks, and paver wheels picking up stone due to sticking of asphalt emulsion, which usually causes tracking of the material into nearby homes and disruption to the fine grade of the DGAB layer

Dense Graded Type HB Asphalt Concrete Base Layer Preparation

Only section 370802 had AC base asphalt concrete mixture with a thickness of 76 mm (job mix formulas is provided in Appendix A) The paving started and was completed on December 8, 1997, laydown temperatures of all the AC layers are listed in Table 12 The south bound lane was paved first and the width of paving ranged from 4 11 to 4 42 m, which took the paving 0 46 to 0 76 m east of the centerline, into the north bound SPS lane This will mean a longitudinal joint in the test section The contractor brought in a grader and removed approximately 0 91 m of pavement east and west of the centerline Paving of the north bound test section started at 1635 hours at station 5+00 and was completed at 1735 hours at station 0+00 Table 13 and Figure 7 list the dates and times of the paving and the temperature and weather data for all the sections The asphalt concrete paver used by the contractor for all his paving operations was a BLAW-KNOX model PF-180H paver and the breakdown roller used was a CAT CB-534C model, while the final roller was a Ferguson 8-12B model Paving width was 3 73 to 3 84 m which includes both the north bound lane and shoulder The nominal thickness of the AC base layer on 370802 before compaction was 102 to 114 mm, which was placed in one lift A bulk sample of the mixture was collected from the paver at the time of the paving operation while at station 2+50 of section 370802 Six 20-kg bags were collected from each location, to be used by NCDOT lab as part of the SPS-8 laboratory testing and 3-19 liter pails to be shipped to the LTPP Materials Reference Library (MRL) at Reno, Nevada, for storage On December 9, 1997 in-situ nuclear gauge densities were taken at 3 locations inside the section (values in Table 10) and rod and level elevations were shot on top of the base layer before placing the binder layer, Figure 5, Elev 3 and Figure 6

Dense Graded Type H Asphalt Concrete Binder Layer Preparation

Only sections 370801 and 370802 had AC binder asphalt concrete mixture with a thickness of 64 mm (job mix formula is provided in Appendix A) Placement of this layer started on the morning of December 11, 1997 and finished during the early afternoon of the same day, laydown temperatures of all the AC layers are listed in Table 12 The south bound lane was paved first and the width of paving averaged around 3 51 m, to avoid a longitudinal joint in the north bound test sections Paving of the north bound test sections started at 1053 hours at station 5+00 of 370802 and was completed at 1228 hours at station 0+00 of section 370801 Table 13 and Figure 7 list the dates and times of the paving and the temperature and weather data for all the sections The asphalt concrete paver used by the contractor for all his paving operations was a BLAW-KNOX model PF-180H paver and the breakdown roller used was a CAT CB-534C model, while the final roller was a Ferguson 8-12B model Paving width was 3 76 to 3 91 m which includes both the north bound lane and shoulder, while the total north and south bound lane and shoulder combined width ranged from 7 32 to 7 57 m at the test section locations The nominal thickness, before compaction, of the AC binder layer on 370802 was 70 to 86

mm, and on 370801 was 76 to 89 mm, which was placed in one lift A bulk sample of the mixture was collected from the paver at the time of the paving operation while at station 2+50 of sections 370802 and 370801 Six 20-kg bags were collected from each location, to be used by NCDOT lab as part of the SPS-8 laboratory testing and 3-19 liter pails to be shipped to the LTPP Materials Reference Library (MRL) at Reno, Nevada, for storage On the same day, in-situ nuclear gauge densities were taken at 3 locations inside each section (values in Table 10) and rod and level elevations were shot on top of the binder layer before placing the surface layer, Figure 5, Elev 4 and Figure 6

Dense Graded Type I-2 Asphalt Concrete Surface Layer Preparation

The same paving and compaction equipment, except for an additional intermediate small vibratory roller, Ingersoll-Rand DD-22, were used for placing and compacting the 38 mm of the surface layer as was used for the AC base and binder courses (job mix formula from the asphalt plant provided in Appendix A) Placement of this layer started on the morning of December 15, 1997 and finished during the afternoon of the same day, laydown temperatures of all the AC layers are listed in Table 12. The south bound lane was paved first and the width of paving averaged around 3 51 m, to avoid a longitudinal joint in the north bound test sections Paving of the north bound test sections started at 1141 hours at station 5+00 of 370859 and was completed at 1427 hours at station 0+00 of section 370801 Table 13 and Figure 7 list the dates and times of the paving and the temperature and weather data for all the sections Paving width was 3 66 to 3 82 m which includes both the north bound lane and shoulder, while the total north and south bound lane and shoulder combined width ranged from 7 37 to 7 48 m at the test section locations The nominal thickness, before compaction, of the AC surface layer on 370859 was 51 to 57 mm, on 370802 was 51 to 70 mm, and on 370801 was 44 to 70 mm, which was placed in one lift A bulk sample of the mixture was collected from the paver at the time of the paving operation while at station 2+50 of sections 370859, 370802, and 370801 Six 20-kg bags were collected from each location, to be used by NCDOT lab as part of the SPS-8 laboratory testing and 3-19 liter pails to be shipped to the LTPP Materials Reference Library (MRL) at Reno, Nevada, for storage On the same day, in-situ nuclear gauge densities were taken at 3 locations inside and one more in the sampling area outside each section (values in Table 10) while the elevations shots were not taken till January 5, 1998, Figure 5, Elev 5 and Figure 6 Cores of the asphalt concrete layers, from the sampling areas, were collected on March 10, 1998 Table 14 lists the thicknesses of all the cores collected on that day Table 15 lists all the thicknesses as determined by the Rod and Level Elevations, while Table 16 summarizes the thickness from the cores and from the rod and level and how much they deviate from design

According to the SPS-8 Construction Guidelines, the as-compacted thickness of the asphalt concrete (surface plus binder plus base) in the test sections shall be constructed to within $\pm$ 6 mm of the value specified in the experimental design (i e 102 $\pm$ 6 mm for 370801, 178 $\pm$ 6 mm for 370802, and 38 $\pm$ 6 mm for 370859) From Table 16, it is clear that the AC thickness, from most of the cores and the Rod and Level elevation measurements, are within the allowable limits Only the cores from section 370802 are shy of the design thickness of 178 mm for the base, binder, and surface layers These cores are taken outside the section and are roughly measured in the field, the accurate rod and level measurements taken inside the sections are all within the allowable limits, which suggests that the sections were built as per the SPS-8 requirements

Asphalt Cement and Aggregate Sampling

The asphalt plant was visited on each of the paving days, December 8, 11, and 15, 1997 and samples were taken of the asphalt cement and the combined aggregate of each layer used in all the asphalt concrete paving. Two quart cans of asphalt cement were collected during each paving day from the plant, to be used by NCDOT for the SPS-8 laboratory testing and one 19 liter pail from each paving day to be shipped to MRL for storage. Also 11-19 liter pails of combined aggregate used for the AC base mix, 11-19 liter pails of combined aggregate used for the AC binder mix, and 11-19 liter pails of combined aggregate used for the AC surface mix were collected from the asphalt plant, to be shipped to MRL for storage

Deviations from the Construction Guidelines

The SPS-8 construction guidelines require consistency in layer thickness for each site. The finished elevations of the DGAB layer should not deviate more than 12 mm from design. All the sections did not meet this requirement, section 370801 had an extra 18 mm, 370802 was shy by 14 mm, and 370859 had an extra 21 mm of DGAB, as measured by the rod and level Also in the construction guidelines it is stated that "the as-compacted thickness of the asphalt concrete (surface plus binder plus base) in the test section shall be constructed to within $\pm$ 6 mm of the values specified in the experiment design (i.e. 102 $\pm$ 6, 178 $\pm$ 6, and 38 $\pm$ 6) All the sections met this requirement, as determined from the rod and level From the cores, section 370802 was shy by 7 mm from design, but since this is a measurement in the sampling area outside the section and the thickness measurement is done in the field with a measuring tape or ruler, the results are not accurate, and we cannot consider this as a deviation

The construction guidelines state that "the finished surface of the pavement should be smooth and provide an excellent ride level As a target, the as-constructed surface should have a pro-rated profile index of less than 160-mm per km as measured by a California type Profilograph and evaluated following California Test 526" No such test was performed on site and only the LTPP Profilometer™ was used to measure the profile, the results are displayed in Table 17

Also according to the Guidelines, "a low viscosity asphalt shall be used to prime the surface of the DGAB and allowed to cure according to agency's practice prior to placement of the asphalt concrete layer" No prime coat was used in this project, NCDOT decided not to place a prime coat of asphalt emulsion on this layer prior to placing the next AC layer to avoid local cars, trucks, and paver wheels picking up stone due to sticking of asphalt emulsion, which usually causes tracking of the material into nearby homes and disruption to the fine grade of the DGAB layer

Also the construction guidelines require that "In new construction, shoulder shall have the full pavement structure across their width and shall be at least 1 22 m wide" Also "In addition, lane width must be at least 3 05 m, although a standard 3 66 m wide lane is preferred" The NC SPS-8 sections were constructed to a lane width of 3 05 m, which is the minimum allowable width, but the shoulder width is 0 61 m which is less than the minimum allowable width for new construction

IV. Post Construction Operations and Initial Performance

The site was marked on February 11, 1998 according to the guidelines. Figure 8 shows the paint marks used on the sections to identify the location of the beginning of each of the sections and at 30 5 m intervals.

Profilometer testing was performed on February 11, 1998 after marking the site The average International Roughness Index (IRI) values from five runs for each of the three sections are presented in Table 17 Plots of the elevation measurements from the three sites are presented in Figures 9 to 11. The site was also videoed on February 11, 1998

The Falling Weight Deflectometer (FWD) and Manual Distress Survey (MDS) on the final layer of the three sections were performed on March 9, 1998. The results from the FWD are presented in a spreadsheet in Appendix A. The MDS also included Dipstick™ measurements which give the rut depth as presented in Table 18 and plotted in Figures 12 to 14

An Automated Weather Station (AWS) was installed near the Cul-De-Sac, at the north end of the project, Figure 4, on March 10-11, 1998 The instrumentation included a combination of an air temperature gauge, a relative humidity gauge, a wind speed and direction gauge, a pyrometer to measure solar radiation, a tipping bucket rain gauge, and a modem for remote data collection

NCDOT are working on installing Weigh In Motion (WIM) equipment or using portable equipment, since the traffic on the road is quite small, only local residents, and a hog farm.

During the monitoring period, February to March 1998, the site was reported as having no obvious distresses and was performing satisfactorily

Table 1 Experimental Design for SPS-8 Study of Environmental Effects in the Absence of Heavy Traffic

PAVEMENT STRUCTURE [1,2]			FACTORS FOR MOISTURE, TEMPERATURE, AND SUBGRADE TYPE [3]											
			WET						DRY					
Type	Surface Thick-ness mm	Base Thick-ness mm	Freeze			No-Freeze			Freeze			No-Freeze		
			Act-ive	Fine	Co-arse	Act-ive	Fine	Co-arse	Act-ive	Fine	Co-arse	Act-ive	Fine	Co-arse
Flex-ible	102	203	x	x	x	x	x	x	x	x	x	x	x	x
	178	305	x	x	x	x	x	x	x	x	x	x	x	x
Rig-id	203	152	x	x	x	x	x	x	x	x	x	x	x	x
	279	152	x	x	x	x	x	x	x	x	x	x	x	x

Notes

1 Dense graded HMAC and jointed plain concrete for flexible and rigid pavements, respectively

2 Dense graded aggregate base

3 Active soil can be either frost susceptible or swelling type relative to the climatic zone

Additional note Flexible and rigid pavement sections may be constructed at the same site

Table 2 Site Layout, SPS-8 370800, SR 1245 NB Jacksonville, NC

Constr-uction Stations	Experi-mental Stations	Length (m)	AC Thickness	Granular Base Thickness	Remarks	Section ID
5+00					Sampling Area 1	
6+00	0+00	152 4	38 mm Surface 64 mm Binder 00 mm Base	203 mm	Begin Monitoring Section	**370801**
11+00	5+00				End Monitoring Section	
12+00					Sampling Area 2	
12+00					Sampling Area 3	
13+00	0+00	152 4	38 mm Surface 64 mm Binder 76 mm Base	305 mm	Begin Monitoring Section	**370802**
18+00	5+00				End Monitoring Section	
19+00					Sampling Area 4	
25+00					Sampling Area 5	
26+00	0+00	152 4	38 mm Surface 00 mm Binder 00 mm Base	152 mm	Begin Monitoring Section	**370859**
31+00	5+00				End Monitoring Section	
32+00					Sampling Area 6	

Note Surface - Dense Graded Type I-2 Asphalt Concrete Surface Mix
Binder - Dense Graded Type H Asphalt Concrete Binder Mix
Base - Dense Graded Type HB Asphalt Concrete Base Mix

Table 3 Scope of Field Testing

Layer	Number of Tests	Location Designation	DOT	LTPP NARO
Asphalt Concrete				
Surface Layer				
In-Situ Density (Nuclear Gage)	15	T28-T36, SA1-SA6	x	
FWD				x
5 Point Levels			x	
Binder Layer				
In-Situ Density (Nuclear Gage)	6	T22-T27	x	
5 Point Levels			x	
Base Layer				
In-Situ Density (Nuclear Gage)	3	T19-T21	x	
5 Point Levels			x	
Unbound Base				
In-Situ Density and Moisture Content (NG)	12	T10-T18, B4-B6	x	
FWD				x
5 Point Levels			x	
Subgrade				
In-Situ Density and Moisture Content (NG)	12	T1-T9, B1-B3	x	
Visual Manual Classification	3	B1-B3	x	
Shoulder Auger Probes (Depth to Rigid Layer)	3	S1-S3	x	
FWD				x
5 Point Levels			x	

Table 4 Scope of Material Sampling

Layer	Number of Samples	Sample Location	DOT	LTPP Lab	MRL
Asphalt Concrete					
Coring - 102 mm Diameter	24	C1-C24	11	13	
AC Surface Bulk Sampling	3	BV4-BV5-BV6	x		x
AC Binder Bulk Sampling	2	BV2-BV3	x		x
AC Base Bulk Sampling (3-19 liter samples of each mix uncompacted)	1	BV1 (from road prior to compaction)	x		x
Combined Aggregate (11-19 liter samples from plant)	3	BU01-BU02-BU03 (from plant)			x
Asphalt Cement (2-19 liter samples from plant)	3	BC01-BC02-BC03 (from plant)	x		x
Unbound Base					
Bulk Sampling (8-25 kg samples)	3	B4-B6	50 kg	150 kg	
Moisture Content Samples	3	B4-B6		x	
Subgrade					
Split Spoon Sampling (2 spoons per hole)	18	A1-A9	x	x	
Bulk Sampling (8-25 kg samples)	3	B1-B3	50 kg	150 kg	
Moisture Content Samples	3	B1-B3		x	

Table 5 Bulk Material Sampling During Construction

A Materials for Testing as Part of the SPS-8 Experiment

Material Description	Number of Samples	Quantity of Each Sample	Sample Location
AC Surface	3	6-20 kg bags	BV4-BV5-BV6
AC Binder	2	6-20 kg bags	BV2-BV3
AC Base	1	6-20 kg bags	BV1
AC Cement used for			Asphalt Plant
AC Surface Course	1	2 quart cans	
AC Binder Course	1	2 quart cans	
AC Base Course	1	2 quart cans	

B Materials for Shipping to the LTPP Materials Reference Library

Material Description	Number of Samples	Quantity of Each Sample	Sample Location
AC Surface	3	3-19 liter pails	BV4-BV5-BV6
AC Binder	2	3-19 liter pails	BV2-BV3
AC Base	1	3-19 liter pails	BV1
AC Cement used for			Asphalt Plant
AC Surface Course	1	1-19 liter pail	
AC Binder Course	1	1-19 liter pail	
AC Base Course	1	1-19 liter pail	
Combined Aggregate (Uncoated) used for			Asphalt Plant
AC Surface Course	1	11-19 liter pails	
AC Binder Course	1	11-19 liter pails	
AC Base Course	1	11-19 liter pails	

Table 6 Field Activities During and Post Construction

	SUBG Layer	DGAB Layer	AC Base Layer	AC Binder Layer	AC Surface Layer	AC Cement Material	Combined Aggregate Material
In-Situ Density	97/10/13	97/11/04 97/11/05 97/12/03	97/12/09	97/12/11	97/12/15	-	-
Split Spoon Sampling	97/10/10	-	-	-	-	-	-
Shoulder Probe	97/10/09	-	-	-	-	-	-
Bulk and Moisture Sampling	97/10/13	97/10/15 97/11/04 97/11/05 97/12/08 97/12/11 97/12/15	97/12/08	97/12/11	97/12/15	97/12/08 97/12/11 97/12/15	97/12/08 97/12/11 97/12/15
Rod&Level Elevations *	97/10/13 *elev #1*	97/11/04 97/12/03 97/12/04 *elev #2*	97/12/09 *elev #3*	97/12/11 *elev #4*	98/01/05 *elev #5*	-	-
Photos Taken	97/10/09 97/10/10 97/10/11 97/10/13 97/10/14	97/10/15 97/11/04 97/11/05 97/12/04 97/12/08	97/12/08 97/12/09	97/12/11	97/12/15	97/12/08	97/12/08
Video Recording	-	-	-	-	98/02/11	-	-
Site Markings	-	-	-	-	98/02/11	-	-
Profilometer Testing	-	-	-	-	98/02/11	-	-
FWD Testing	97/10/13	97/11/05 97/12/03	-	-	98/03/09	-	-
MDS Survey	-	-	-	-	98/03/09	-	-
102 mm Coring	-	-	-	-	97/03/10	-	-

Date format is in yy/mm/dd

* Note Refer to Figure 5 for elevation number locations

Table 7 Guidelines vs Actual Initial Monitoring Measurement Dates

Measurement Type	Monitoring Period After Construction	Monitoring Date as per the Guidelines - Construction Finished December 15, 1997	Actual Monitoring Date
Deflection	1-3 Months	Jan 15 - Mar 15, 1998	Mar 09, 1998
Profile	< 2 Months	Before Feb 15, 1998	Feb 11, 1998
Distress Survey	< 6 Months	Before Jun 15, 1998	Mar 09, 1998
Friction	3-12 Months	Mar 15 - Dec 15, 1998	-

Table 8 Field and Laboratory Material Testing

Test Type	LTPP Test Desig	LTPP Prot-ocol	Tests per Layer	Material Source /Test Location	Comments	DOT	LTPP Lab
SUBGRADE					200kg bulk	50kg	150kg
Sieve Analysis	SS01	P51	3	B1-B3	sample of	x	x
Hydrometer to 0 01 mm	SS02	P42	3	B1-B3	top 300mm	x	x
Atterberg Limits	SS03	P43	3	B1-B3		x	x
Classification and Type	SS04	P52	12	A1-A9, B1-B3	Visual only	x	x
Moisture/Density Relations	SS05	P55	3	B1-B3			x
Resilient Modulus	SS07	P46	3	B1-B3			x
Natural Moisture Content	SS09	P49	3	B1-B3			x
In-Place Density		LTPP	12	T1-T9, B1-B3		x	
Depth to Rigid Layer		LTPP	3	S1, S2, S3		x	
Expansion Index	SS12	P60	3	B1-B3		x	
UNBOUND GRANULAR BASE					200kg bulk uncompac-	50kg	150kg x
Particle Size Analysis	UG01	P41	3	B4-B6	ted sample		x
Sieve Analysis (washed)	UG02	P41	3	B4-B6			x
Atterberg Limits	UG04	P43	3	B4-B6			x
Moisture/Density Relations	UG05	P44	3	B4-B6			x
Resilient Modulus	UG07	P46	3	B4-B6			x
Classification	UG08	P47	3	B4-B6			x
Permeability	UG09	P48	3	B4-B6		x	
Natural Moisture Content	UG10	P49	3	B4-B6			x
In-Place Density		LTPP	12	T10-18, B4-6		x	
AC SURFACE, BINDER, AND BASE							
Core Exam /Thickness	AC01	P01	24	All Cores		11	13
Bulk Specific Gravity	AC02	P02	24	All Cores		11	13
Maximum Specific Gravity	AC03	P03	3	BV1-BV6	100kg bulk	x	
AC% (Extraction)	AC04	P04	3	BV1-BV6	sample	x	
Moisture Susceptibility	AC05	P05	3	BV1-BV6	from road	x	
Creep Compliance	AC06	P06	1	C14			x
Resilient Modulus	AC07	P07	3	C1-C3, C9-C11, C17-C19			x
Tensile Strength	AC07	P07	12	C1-C4 C9-C12 C17-C20			x
In-Place Density		LTPP	24	T19-T36, SA1-SA6		x	

Table 8(Cont) Field and Laboratory Material Testing

Test Type	LTPP Test Desig	LTPP Prot-ocol	Tests per Layer	Material Source /Test Location	Comments	DOT	MRL
ASPHALT CEMENT							
Abson Recovery	AE01	P21	3	BV1-BV6		x	
Penetration (50, 77, 90F)	AE02	P22	3	BV1-BV6		x	
Specific Gravity (60F)	AE03	P23	3	BV1-BV6		x	
Viscosity at 140F, 275F	AE05	P25	3	BV1-BV6		x	
EXTRACTED AGGREGATE							
Specific Gravity							
Coarse Aggregate	AG01	P11	3	BV1-BV6		x	
Fine Aggregate	AG02	P12	3	BV1-BV6		x	
Type and Classification							
Coarse Aggregate	AG03	P13	3	BV1-BV6		x	
Fine Aggregate	AG03	P13	3	BV1-BV6		x	
Gradation of Aggregate	AG04	P14	3	BV1-BV6		x	
ASPHALT CEMENT (from tanker)							x
Penetration (50, 77, 90F)	AE02	P22	3	BC01-BC03	Bulk samples taken from plant	x	
Specific Gravity (60F)	AE03	P23	3	BC01-BC03		x	
Viscosity at 140F, 275F	AE05	P25	3	BC01-BC03		x	
COMBINED AGGREGATE				BU01-BU03	Bulk samples taken from plant		x

Table 9 Construction Geometrics and Dates

Section ID and Structure	Subgrade Completed yy/mm/dd	DGAB Completed yy/mm/dd	AC BASE Completed yy/mm/dd	AC Binder Completed yy/mm/dd	AC Surface Completed yy/mm/dd
370801 38 mm AC SURFACE 64 mm AC BINDER 00 mm AC BASE 203 mm DGAB SUBGRADE	 97/10/13	 97/12/03	 - 	 97/12/11 	 97/12/15
370802 38 mm AC SURFACE 64 mm AC BINDER 76 mm AC BASE 305 mm DGAB SUBGRADE	 97/10/13	 97/12/03	 97/12/08 	 97/12/11 	 97/12/15
370859 38 mm AC SURFACE 00 mm AC BINDER 00 mm AC BASE 152 mm DGAB SUBGRADE	 97/10/13	 97/12/03	 - 	 - 	 97/12/15

Table 10 Nuclear Gage In Situ Densities and Moisture Contents During and Post Construction

Section	370801			370802			370859		
Layer	**Subg-rade**	**DG-AB Nov. Dec.**	**AC base binder surface**	**Subg-rade**	**DG-AB Nov. Dec.**	**AC base binder surface**	**Subg-rade**	**DG-AB Nov. Dec.**	**AC base binder surface**
Date 97/mm/dd	10/13	11/04 11/05 12/03	12/09 12/11 12/15	10/13	11/04 11/05 12/03	12/09 12/11 12/15	10/13	11/04 11/05 12/03	12/09 12/11 12/15
Depth from Surface to top of layer	305 mm	102 mm	- 38 mm 0 mm	483 mm	178 mm	102 mm 38 mm 0 mm	191 mm	38 mm	- - 0 mm
Density (kg/m^3)**									
Rod Depth→ Station (o/s)	203 mm	152 mm	BS	203 mm	203 mm	BS	203 mm	152 mm	BS
0-25 (1.52 m)			- - 2185			- - 2214			- - 2190
1+00 (1.52 m)		- 2246 2220	- 2098 2276	1749	- 2207 2191	1917 2074 2217	1981	- 2257 2271	- - 2126
1+01.5(0.46 m)	1726								
2+50 (1.52 m)	1762* *o/s 0 76m	- 2196 2191	- 2130 2198	2010	- 2294 2255	2084 2002 2199	1948	- 2230 2222	- - 2081
4+00 (1.52 m)		- 2207 2159	- 1847 2219	2015	- 2275 2262	2078 2009 2222	1927	- 2217 2188	- - 2167
4+02(1.07 m)	1748								
5+25 (1.52 m)			- - 2180		2295 - 2146	- - 2212			- - 2228
5+35 (0.91 m)		- 2217 2151						2166 - 2106	
5+40 (0.91 m)	1724			1879			1714		
% Moisture**									
	BS	BS		BS	BS		BS	BS	
1+00		2 4/2 2		6 9	2 5/2 6		10 3	3 5/2 8	
1+01.5	8 7								
2+50	8 8	2 1/2 2		6 2	2 5/2 3		8 4	2 6/2 7	
4+00		2 2/2 3		6 8	2 6/2 5		7 1	2 2/2 4	
4+02	7 6								
5+25					2 6/2 5				
5+35		2 2/2 6						2 7/2 4	
5+40	5 4			7 6			9 1		

** Note Density is either Direct Transmission (rod depth given in mm) or Back Scatter BS
Moisture is always Back Scatter BS

Table 11 Conventional Densities and Moisture Contents During Construction

Section ID	370801		370802		370859	
	Subg.	**DGAB**	**Subg.**	**DGAB**	**Subg.**	**DGAB**
Date yy/mm/dd	97/10/13	97/11/05	97/10/13	97/11/04	97/10/13	97/11/04
Location: Construction Experiment	11+40 5+40	11+35 5+35	18+40 5+40	18+25 5+25	31+40 5+40	31+35 5+35
Offset from EOP (m)	0 91	0 91	0 91	0 91	0 91	0 91
Moisture (%)	6 8	4 1	8 3	5 4	8 7	4 1
Dry Density (kg/m^3)	1704	2286	1815	2327	1735	2236
Compaction (%)	100 8	100 1	102 5	101 9	104 6	97 9

Table 12 Asphalt Concrete Laydown Temperatures

Section ID	370801		370802			370859
Layer	**Binder**	**Surface**	**Base**	**Binder**	**Surface**	**Surface**
Temp ^{o}C	154 154 135 157 154	152 152 149 152	137 135 138 135 135 141	154 149 154 154 149	154 149 149	154 149 152 149
Average	151	151	137	152	151	151
Minimum	135	149	135	149	149	149
Maximum	157	152	141	154	154	154
Std Dev	8 9	1 5	2 4	2 7	2 9	2 4
Number	5	4	6	5	3	4

Note Air temperature and weather conditions during paving are summarized in Table 13

Table 13 Paving Dates, Times, Locations, Widths, and Weather Conditions

Date	Time	Section ID	Average Paving Laydown Width (m)	AC Layer	Station*	Weather
Dec. 08, 97	1635-1735	370802	3 78	Base	500-0	Partly Cloudy 3°C
Dec. 11, 97	1053-1118	370802	3 87	Binder	500-0	Partly Cloudy 7°C
	1134-1228	370801	3 84	Binder	500-0	Partly Cloudy 14°C
Dec. 15, 97	1141-1205	370859	3 75	Surface	500-0	Windy / Partly Cloudy 8°C
	1236-1313	370802	3 72	Surface	500-0	Windy / Partly Cloudy 8°C
	1400-1427	370801	3 78	Surface	500-0	Windy / Partly Cloudy 8°C

* Note Station 500-0 indicates that paving started at station 500 and ended at station 0

Table 14 Core Thickness from the Field Material Sampling and Testing Forms

		Before Section		After Section		Design Specs H ± 7 mm		
Section ID	**Offset m**	**Core #**	**Thickness H mm**	**Core #**	**Thickness H mm**	**Thickness H mm**	**Lower Limit**	**Upper Limit**
370801	1 98	CA01	104	CA05	89*	102	96	108
	1 52	CA02	99	CA06	94*			
	1 07	CA03	97	CA07	97			
	0 61	CA04	102	CA08	107			
	avg	of 4	101		97	avg of 8		99
370802	1 98	CA09	152*	CA13	191*	178	172	184
	1 52	CA10	155*	CA14	185*			
	1 07	CA11	157*	CA15	188*			
	0 61	CA12	163*	CA16	178			
	avg	of 4	157*		185*	avg of 8		171*
370859	1 98	CA17	33	CA21	38	38	32	44
	1 52	CA18	33	CA22	38			
	1 07	CA19	30*	CA23	38			
	0 61	CA20	33	CA24	38			
	avg	of 4	32		38	avg of 8		35

Thickness is in millimeters

The SPS-8 construction guidelines require consistency in layer thickness for each site In the guidelines it is stated that "the as-compacted thickness of the asphalt concrete (surface plus binder plus base) in the test section shall be constructed to within ± 6 mm of the values specified in the experiment design (i e 102 ± 6, 178 ± 6, and 38 ± 6)

* Indicates an asphalt concrete compacted thickness (surface plus binder plus base) that exceeds the allowable limit of ± 6 mm of the values specified in the experiment design

Table 15 Layer Thickness from Rod and Level Elevations

	370801				370802					370859		
SP H		203	64	38		305	76	64	38		152	38
LOC	Station	DGAB	BIND	SURF	Station	DGAB	BASE	BIND	SURF	Station	DGAB	SURF
EOP	600	210	64	46	1300	366	34	61	64	2600	195	30
OWP	(0+00)	204	58	46	(0+00)	344	34	61	58	(0+00)	180	21
MID		204	55	49		341	37	55	55		174	21
IWP		213	61	43		335	37	58	49		177	18
CL		216	55	46		341	55	58	40		171	27
EOP	650	189	61	46	1350	347	88	64	67	2650	186	40
OWP	(0+50)	201	55	40	(0+50)	323	76	61	58	(0+50)	177	34
MID		210	55	40		323	58	64	52		174	34
IWP		210	58	40		326	46	61	46		186	34
CL		195	61	37		317	52	64	40		195	40
EOP	700	192	64	43	1400	296	67	64	55	2700	235	37
OWP	(1+00)	250	37	43	(1+00)	293	58	64	52	(1+00)	219	30
MID		247	52	40		302	49	64	49		207	30
IWP		226	52	40		308	52	64	43		195	34
CL		201	58	40		320	58	61	46		189	37
EOP	750	180	70	40	1450	287	64	70	46	2750	21	37
OWP	(1+50)	189	61	43	(1+50)	290	61	67	52	(1+50)	189	27
MID		192	58	40		296	64	58	55		158	27
IWP		201	46	43		311	61	58	55		149	24
CL		201	55	40		293	73	55	61		146	37
EOP	800	210	64	46	1500	271	73	58	43	2800	186	27
OWP	(2+00)	226	49	46	(2+00)	265	76	55	43	(2+00)	162	21
MID		201	55	40		258	79	49	46		143	21
IWP		198	55	37		265	85	46	43		140	24
CL		183	55	37		271	91	37	49		143	49
EOP	850	177	73	43	1550	290	82	61	40	2850	186	40
OWP	(2+50)	165	61	43	(2+50)	283	76	64	37	(2+50)	171	37
MID		152	61	40		283	79	61	40		168	34
IWP		174	52	40		296	79	64	34		165	30
CL		174	58	40		308	88	61	34		158	37
EOP	900	223	70	40	1600	271	67	61	43	2900	192	40
(3+00)	(3+00)	223	52	40	(3+00)	247	76	58	40	(3+00)	174	30
MID		216	52	43		238	85	55	40		171	27
IWP		216	49	40		247	88	55	34		171	24
CL		213	58	43		262	98	52	40		165	34
LOP	950	271	73	43	1650	280	67	70	46	2950	195	37
OWP	(3+50)	265	64	43	(3+50)	262	64	73	46	(3+50)	165	30
MID		265	64	43		241	85	61	46		143	37
IWP		265	55	40		250	91	55	40		143	34
CL		283	49	40		274	91	49	46		146	30
EOP	1000	271	55	58	1700	308	79	85	43	3000	201	43
OWP	(4+00)	247	46	55	(4+00)	293	79	79	37	(4+00)	168	37
MID		250	49	49		287	79	67	37		149	40
IWP		247	46	46		287	85	58	30		146	40
CL		235	52	43		296	98	43	37		158	46
EOP	1050	247	67	61	1750	305	82	73	52	3050	192	40
OWP	(4+50)	247	52	52	(4+50)	287	76	70	55	(4+50)	180	34
MID		256	40	49		274	85	61	52		171	34
IWP		250	43	43		268	91	55	49		171	40
CL		253	46	43		253	107	58	52		174	40
EOP	1100	262	70	52	1800	314	94	55	46	3100	146	43
OWP	(5+00)	253	52	49	(5+00)	317	94	55	43	(5+00)	152	37
MID		238	49	46		280	107	55	40		162	40
IWP		235	46	43		280	119	49	37		177	37
CL		247	46	37		253	146	49	43		189	43
AVG		221*	56	43		291*	76	60	46		173*	34
MIN		152	37	37		238	34	37	30		140	18
MAX		283	73	61		366	146	85	67		235	49
DEV		31	8	5		30	21	8	8		21	7

* Note Outside specification thickness (SP H) limits of design thickness +/- 12 mm for the DGAB and +/- 6 mm for the AC layers

Table 16 Summary of Average Layer Thickness from Rod and Level Survey and Cores

	370801 203 mm DGAB 0 mm AC Base 64 mm AC Binder 38 mm AC Surface	370802 305 mm DGAB 76 mm AC Base 64 mm AC Binder 38 mm AC Surface	370859 152 mm DGAB 0 mm AC Base 0 mm AC Binder 38 mm AC Surface
Thickness form Rod & Level (mm)			
DGAB (Diff. From Design)	221* (+18)	291* (-14)	173* (+21)
Base Layer (Diff. From Design)	-	76 (0)	-
Binder Layer (Diff. From Design)	56 (-8)	60 (-4)	-
Surface Layer (Diff. From Design)	43 (+5)	46 (+8)	34 (-4)
Total AC (Diff. From Design)	99 (-3)	182 (+4)	34 (-4)
Thickness from Cores (mm)			
Base Layer (Diff. From Design)	-	69 (-7)	-
Binder Layer (Diff. From Design)	58 (-6)	61 (-3)	-
Surface Layer (Diff. From Design)	41 (+3)	41 (+3)	35 (-3)
Total AC Diff. From Design	99 (-3)	171** (-7)	35 (-3)

Thickness is in millimeters

The SPS-8 construction guidelines require consistency in layer thickness for each site The finished elevations of the DGAB layer should not deviate more than 12 mm from design Also in the construction guidelines it is stated that "the as-compacted thickness of the asphalt concrete (surface plus binder plus base) in the test section shall be constructed to within $\pm$ 6 mm of the values specified in the experiment design (i e 102 $\pm$ 6, 178 $\pm$ 6, and 38 $\pm$ 6)

* Indicates a DGAB thickness that exceeds the allowable limit of $\pm$ 12 mm of the values specified in the experiment design

** Indicates an asphalt concrete compacted thickness (surface plus binder plus base) that exceeds the allowable limit of $\pm$ 6 mm of the values specified in the experiment design

Table 17 IRI Values from the Profilometer Survey After Construction

Section ID	Date Surveyed dd mmm yy	Left Wheel Path IRI of 5 Runs (m/km)	Right Wheel Path IRI of 5 Runs (m/km)	Average IRI of 5 Runs (m/km)
SR 1245 North Bound New Construction				
370801	11 Feb 98	1 340	1 085	1 213
370802	11 Feb 98	1 385	1 268	1 327
370859	11 Feb 98	1 263	1 598	1 431

Plots of Profilometer Elevations, Left Wheel Path and Right Wheel Path, are presented in Figures 9-11

Table 18 Rut Depth from the Dipstick Survey After Construction

Section ID	Date Surveyed dd mmm yy	LWP Avg Rut Depth (mm)	RWP Avg Rut Depth (mm)	Average Rut Depth (mm)
SR 1245 North Bound New Construction				
370801	09 Mar 98	1 7 mm	2 3 mm	2 0 mm
370802	09 Mar 98	2 4 mm	2 2 mm	2 3 mm
370859	09 Mar 98	0 7 mm	1 3 mm	1 0 mm

Rut Depth Plots, Left Wheel Path (LWP) and Right Wheel Path (RWP), are presented in Figures 12-14

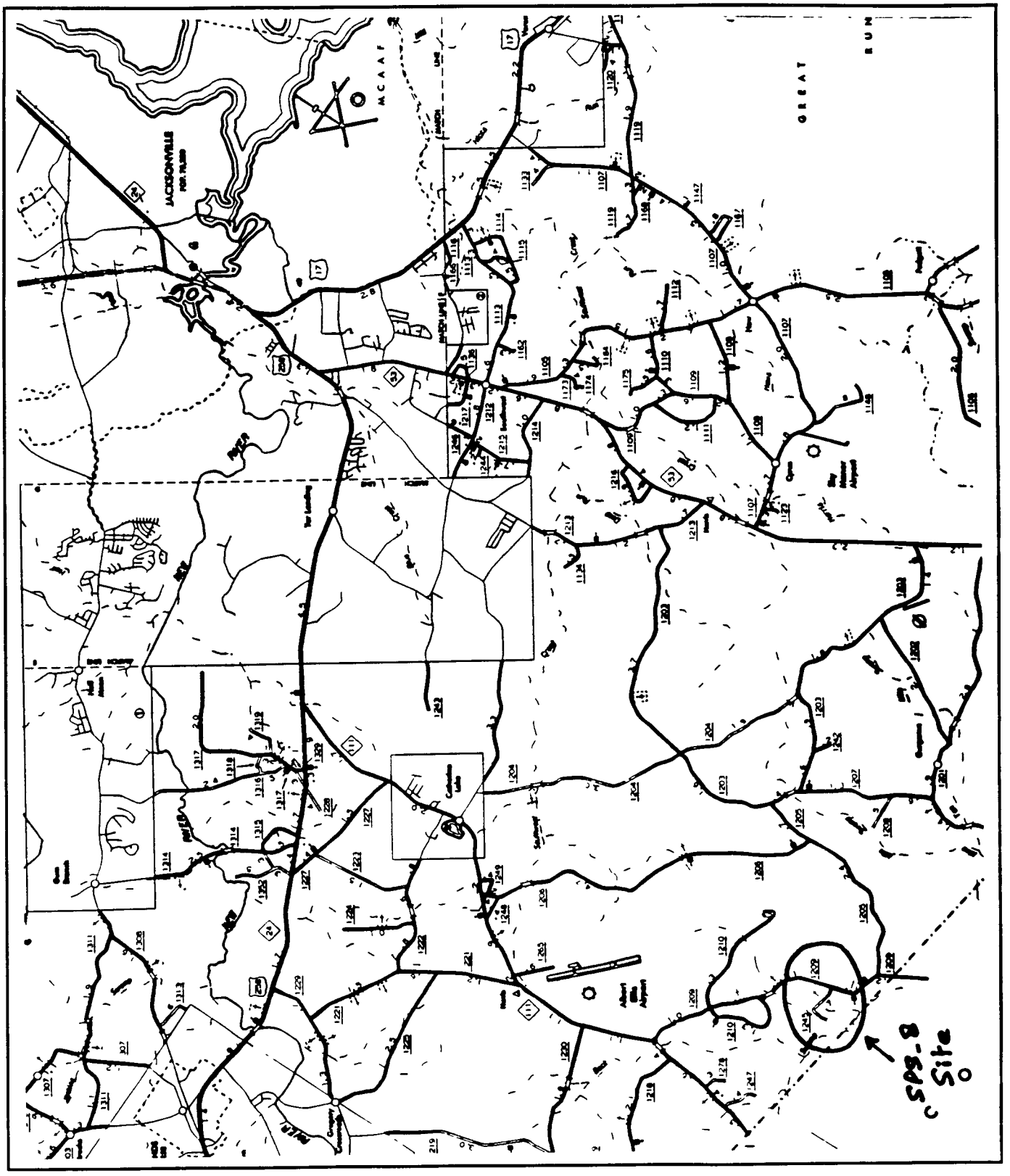


Figure 1 Site Location Map - SPS Project 370800

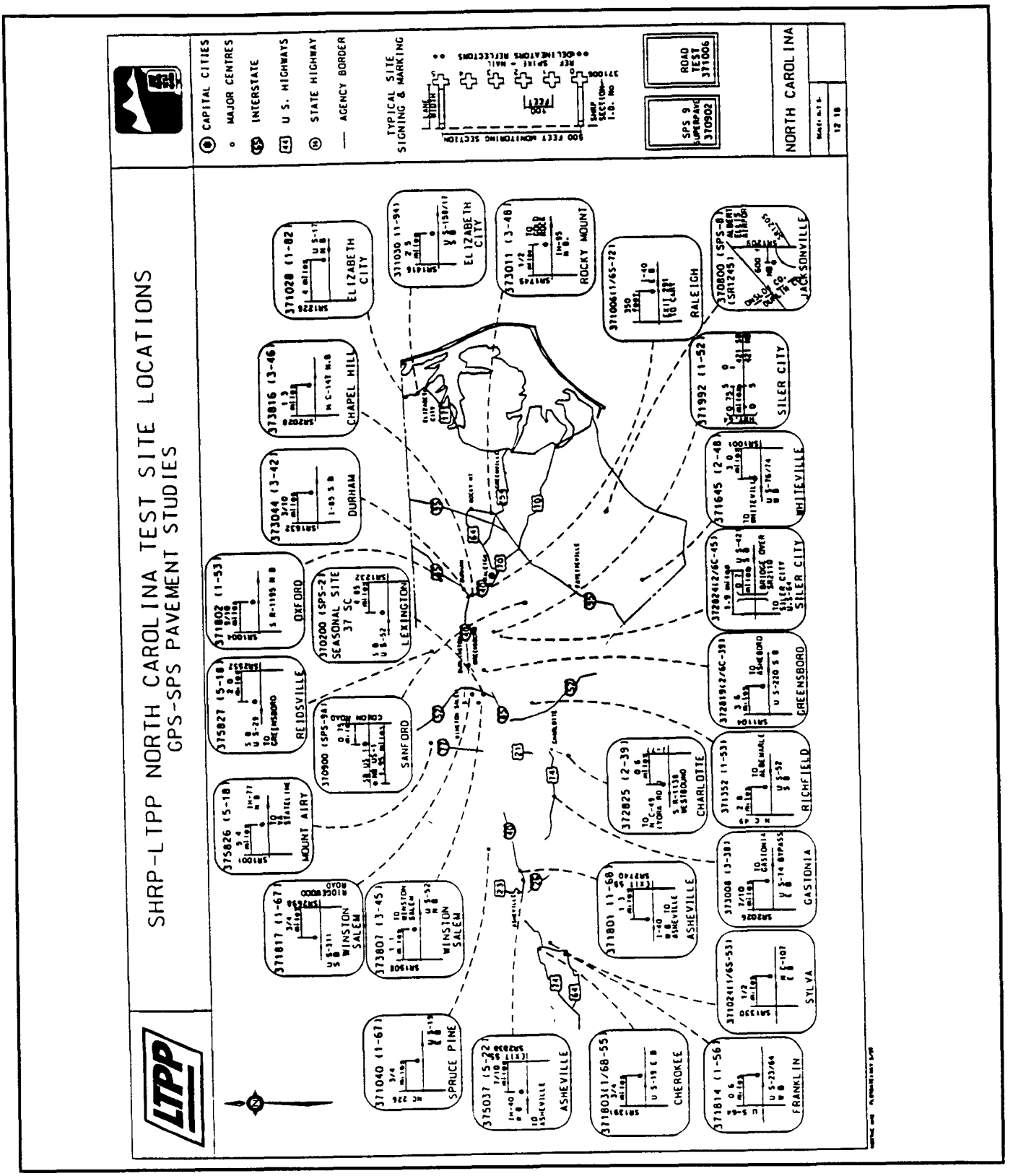


Figure 2. FHWA-LTPP North Carolina Test Site Locations

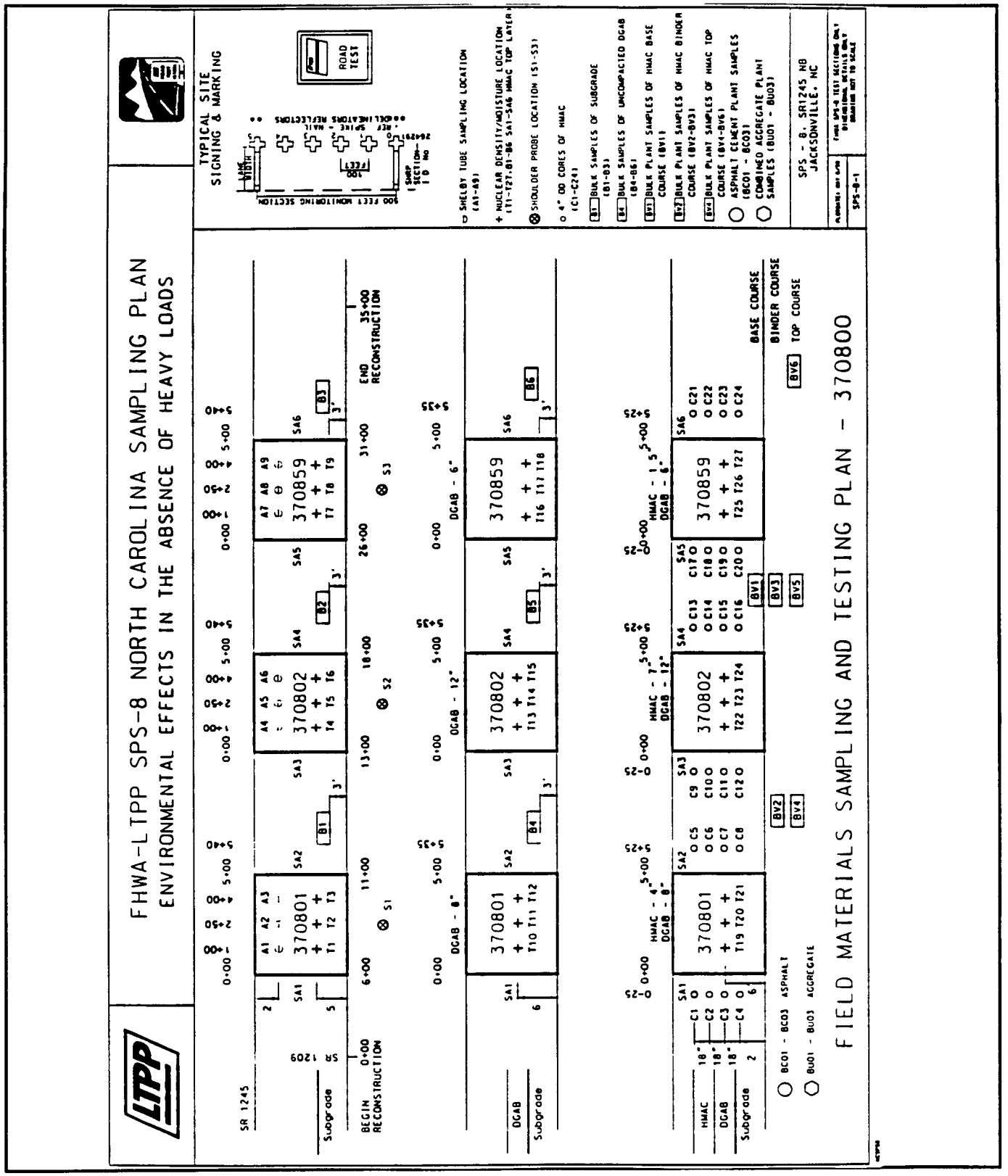


Figure 3. Field Materials Sampling and Testing Plan - 370800

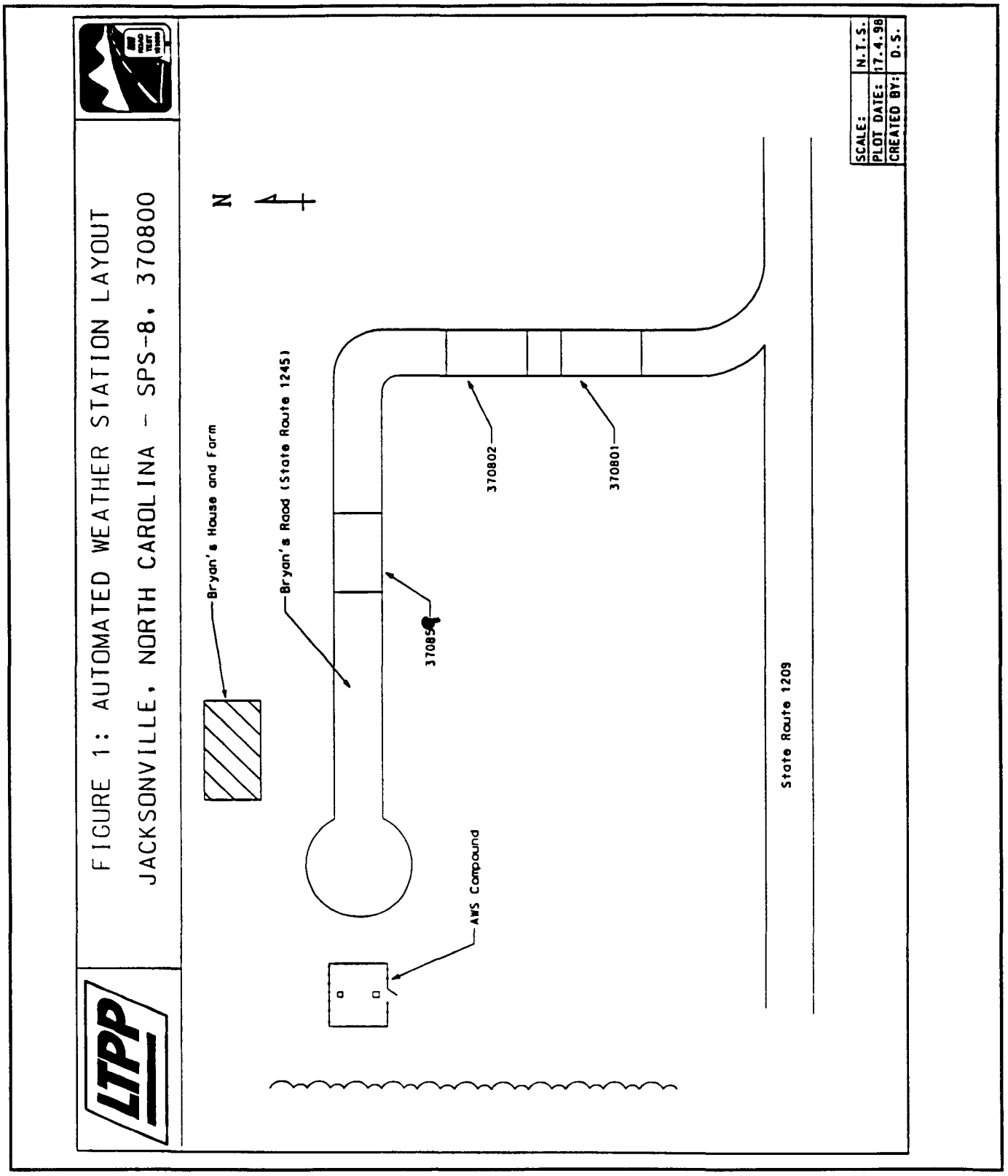
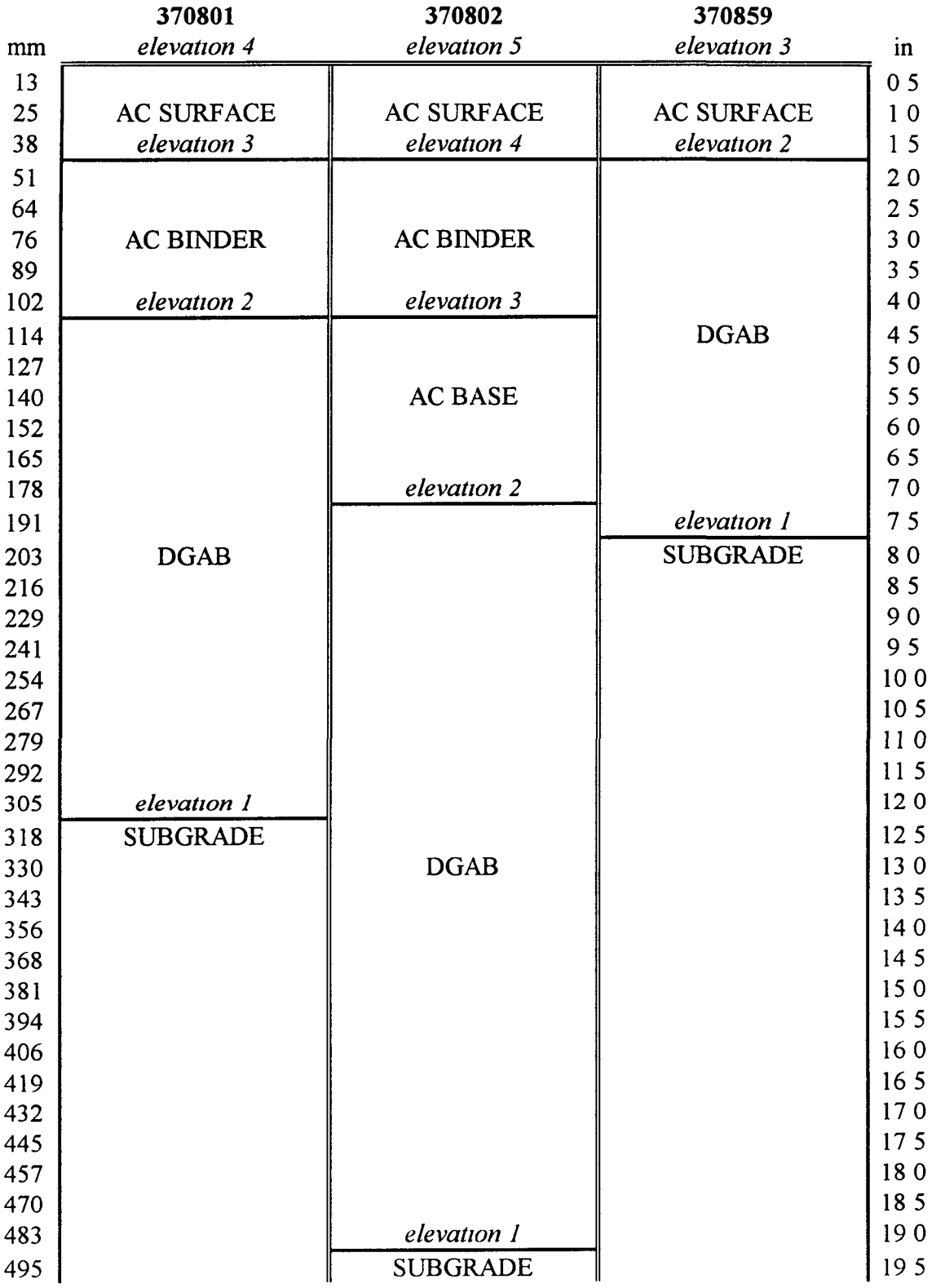
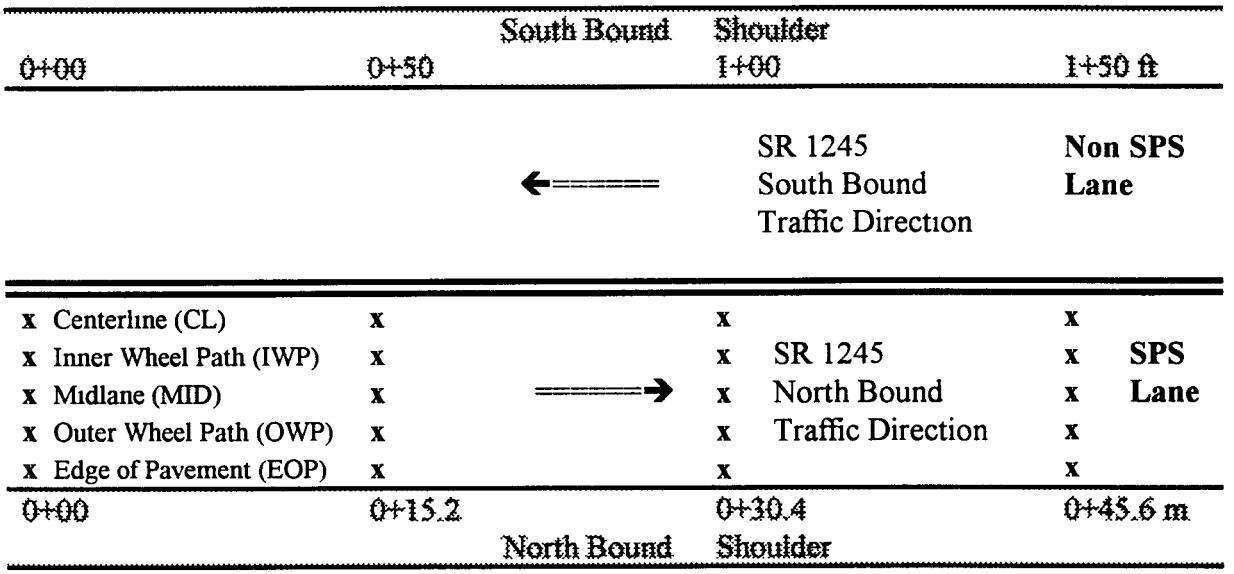


Figure 4. Automated Weather Station Layout Jacksonville, NC, SPS-8, 370800



Note Refer to Table 6 for the dates of the five stages of elevation measurements

Figure 5 Pavement Structures and the Five Stages of Rod and Level Elevations



x Location of Elevation Measurement

EOP Offset	0 00 m
OWP Offset	0 92 m
MID Offset	1 83 m
IWP Offset	2 75 m
CL Offset	3 66 m

Figure 6 Location of Elevation Measurements

AC Base

	370801		370802		370859		
SB Shoulder							
SR 1245 South Bound Traff Direc ⟵ (CL)							non SPS SB lane
SR 1245 North Bound Traff Direc ⟶			76 mm BV1		←Thickness ←Bulk Sample		SPS NB lane ← **Dec.08** Paving Date
NB Shoulder			1735	1635			SPS Pav Time
	0+00	5+00	0+00	5+00	0+00	5+00	Exper Stations
	6+00	11+00	13+00	18+00	26+00	31+00	Const Stations

AC Binder

	370801		370802		370859		
SB Shoulder							
SR 1245 South Bound Traff Direc ⟵ (CL)							non SPS SB lane
SR 1245 North Bound Traff Direc ⟶	64 mm BV2		64 mm BV3		←Thickness ←Bulk Sample		SPS NB lane ← **Dec.11** Paving Date
NB Shoulder	1228	1134	1118	1053			SPS Pav Time
	0+00	5+00	0+00	5+00	0+00	5+00	Exper Stations
	6+00	11+00	13+00	18+00	26+00	31+00	Const Stations

AC Surface

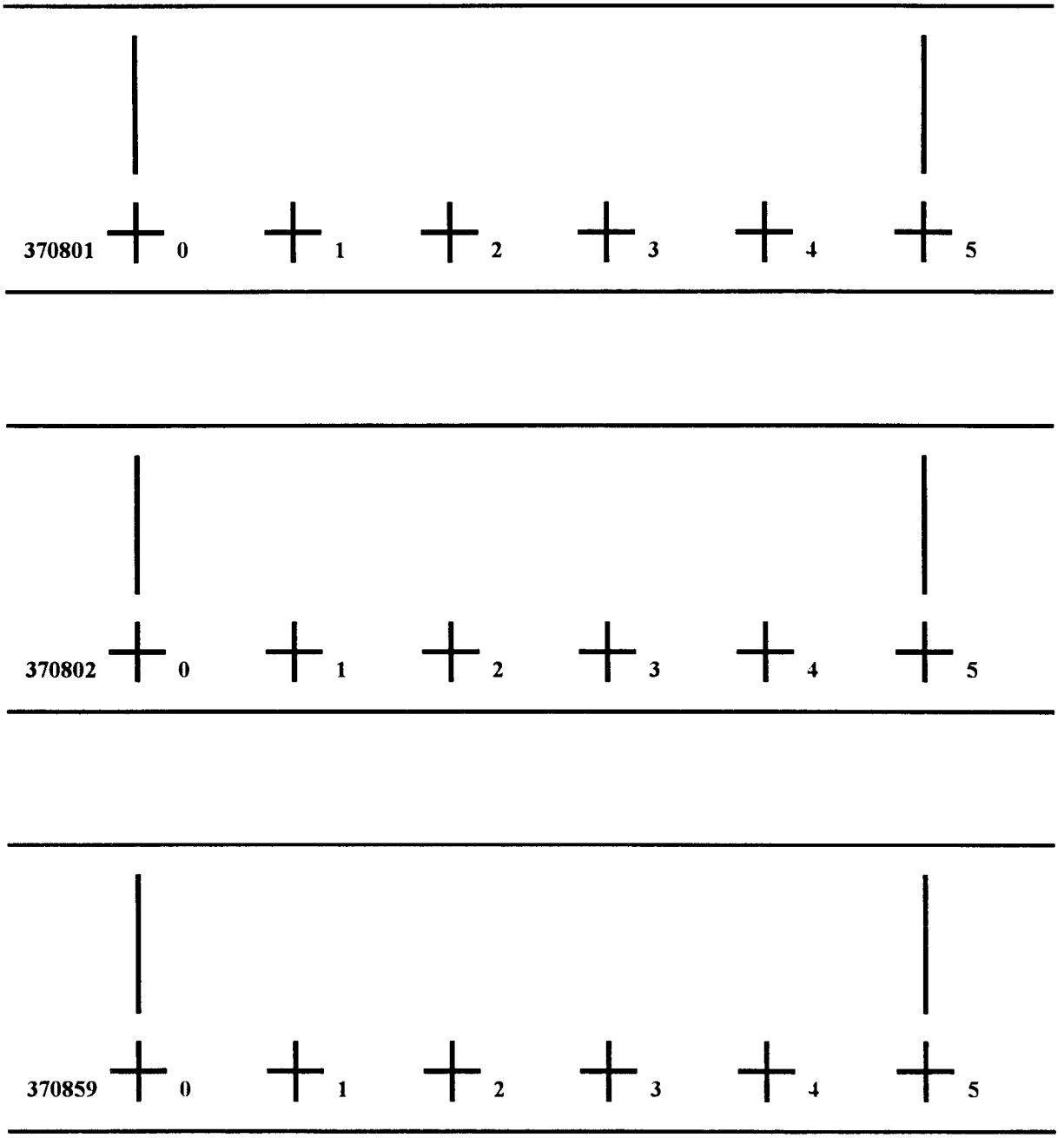
	370801		370802		370859		
SB Shoulder							
SR 1245 South Bound Traff Direc ⟵ (CL)							non SPS SB lane
SR 1245 North Bound Traff Direc ⟶	38 mm BV4		38 mm BV5		38 mm BV6		←Thickness SPS NB lane ← **Dec.15** Paving Date
NB Shoulder	1427	1400	1313	1236	1205	1141	SPS Pav Time
	0+00	5+00	0+00	5+00	0+00	5+00	Exper Stations
	6+00	11+00	13+00	18+00	26+00	31+00	Const Stations

Not to scale

CL - Center Line

Refer to Table 13 for more details on the paving of the AC base, binder, and surface layers

Figure 7 Surface Layer Type, Paving Dates, Paving Times, and Bulk Sample Locations



Not to scale

Figure 8 Site Marking Plan

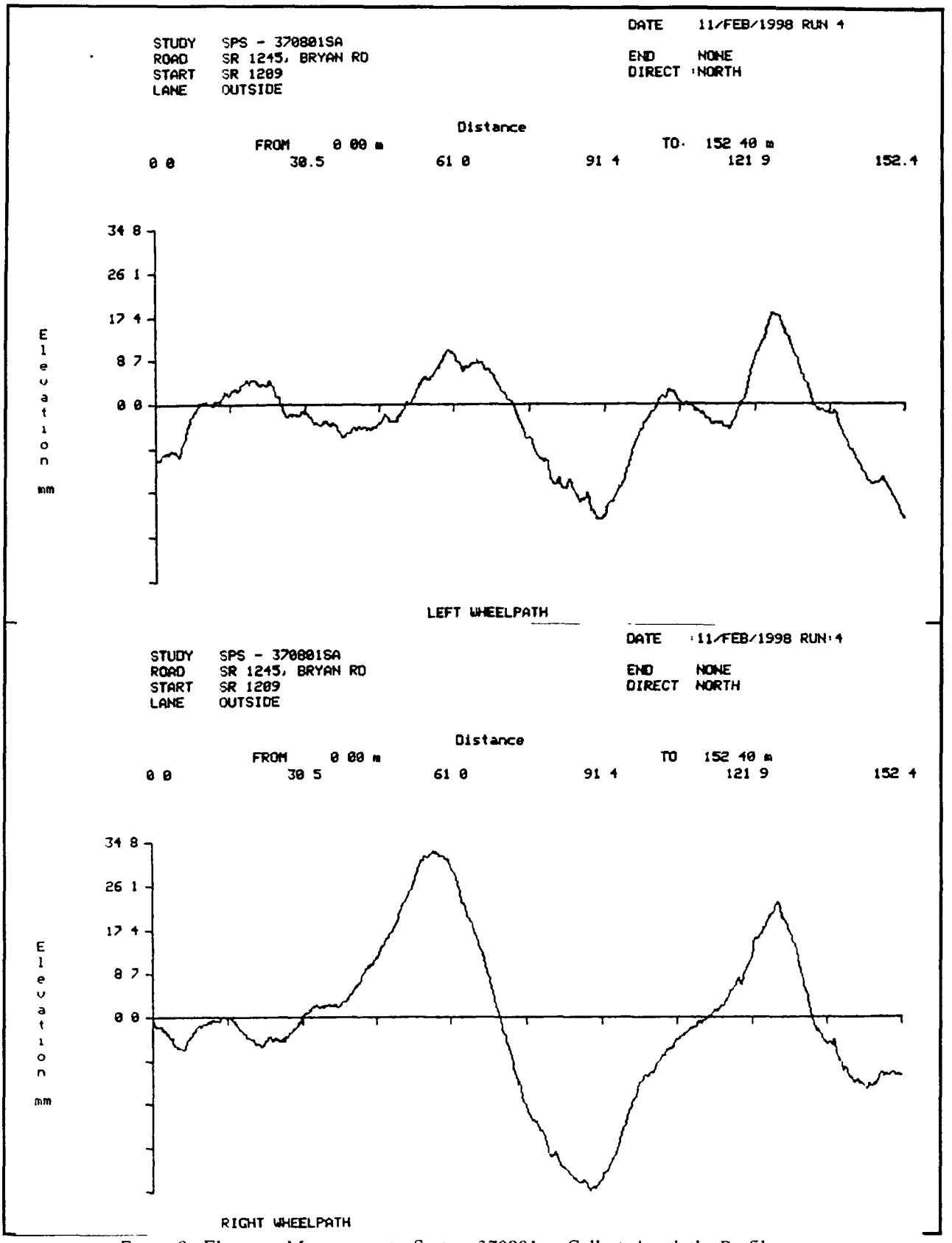


Figure 9 Elevation Measurements. Section 370801 as Collected with the Profilometer

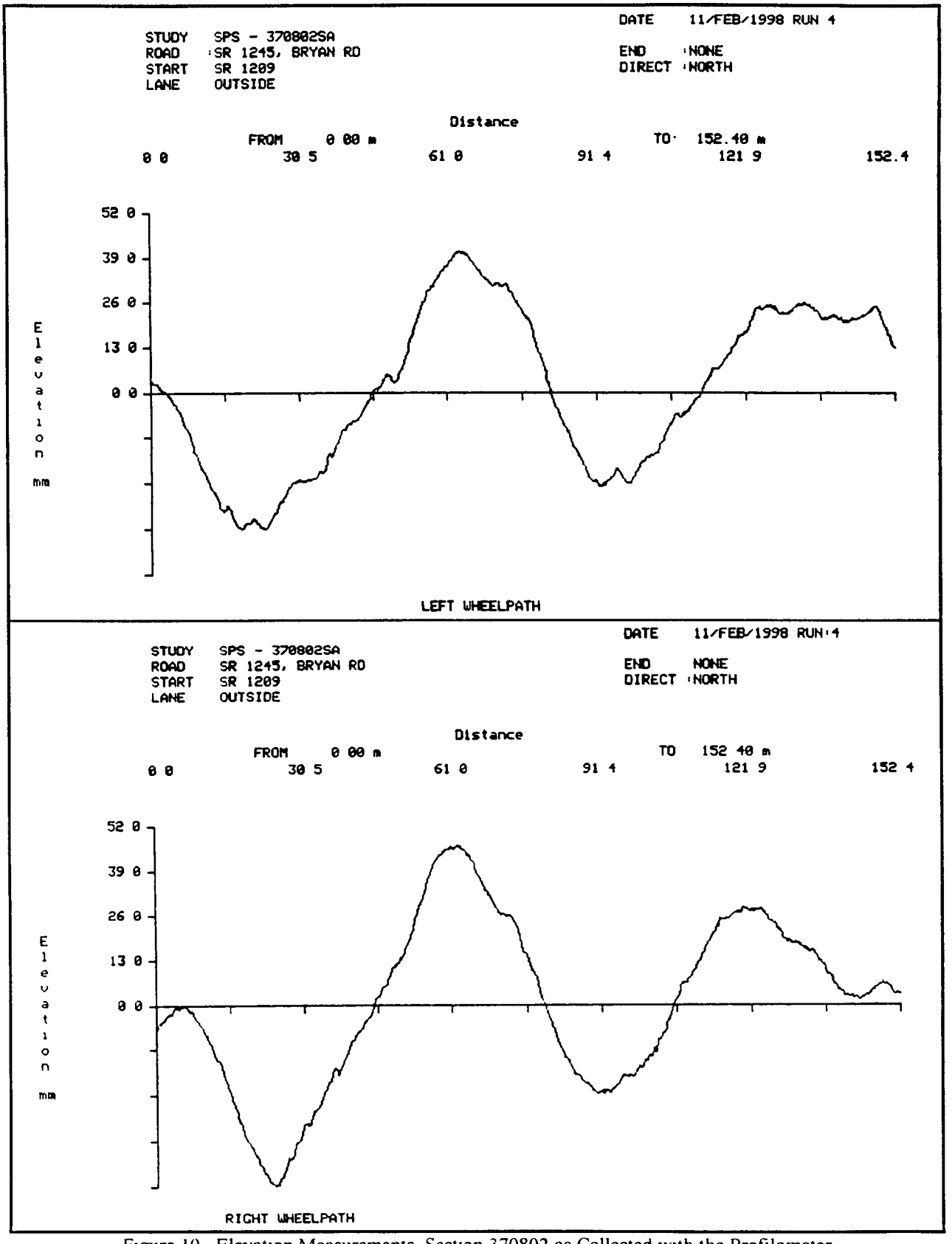


Figure 10 Elevation Measurements, Section 370802 as Collected with the Profilometer

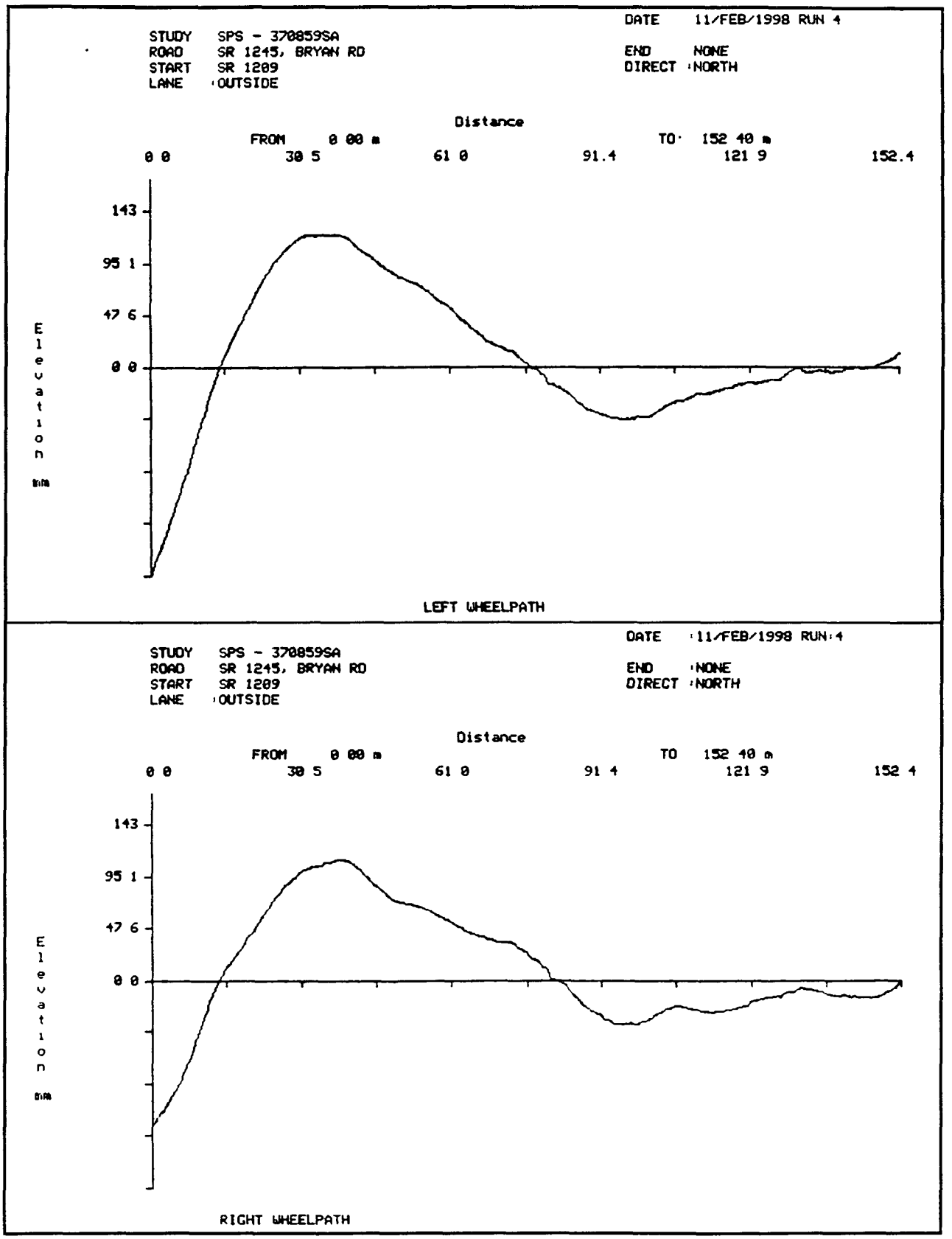


Figure 11 Elevation Measurements. Section 370859 as Collected with the Profilometer

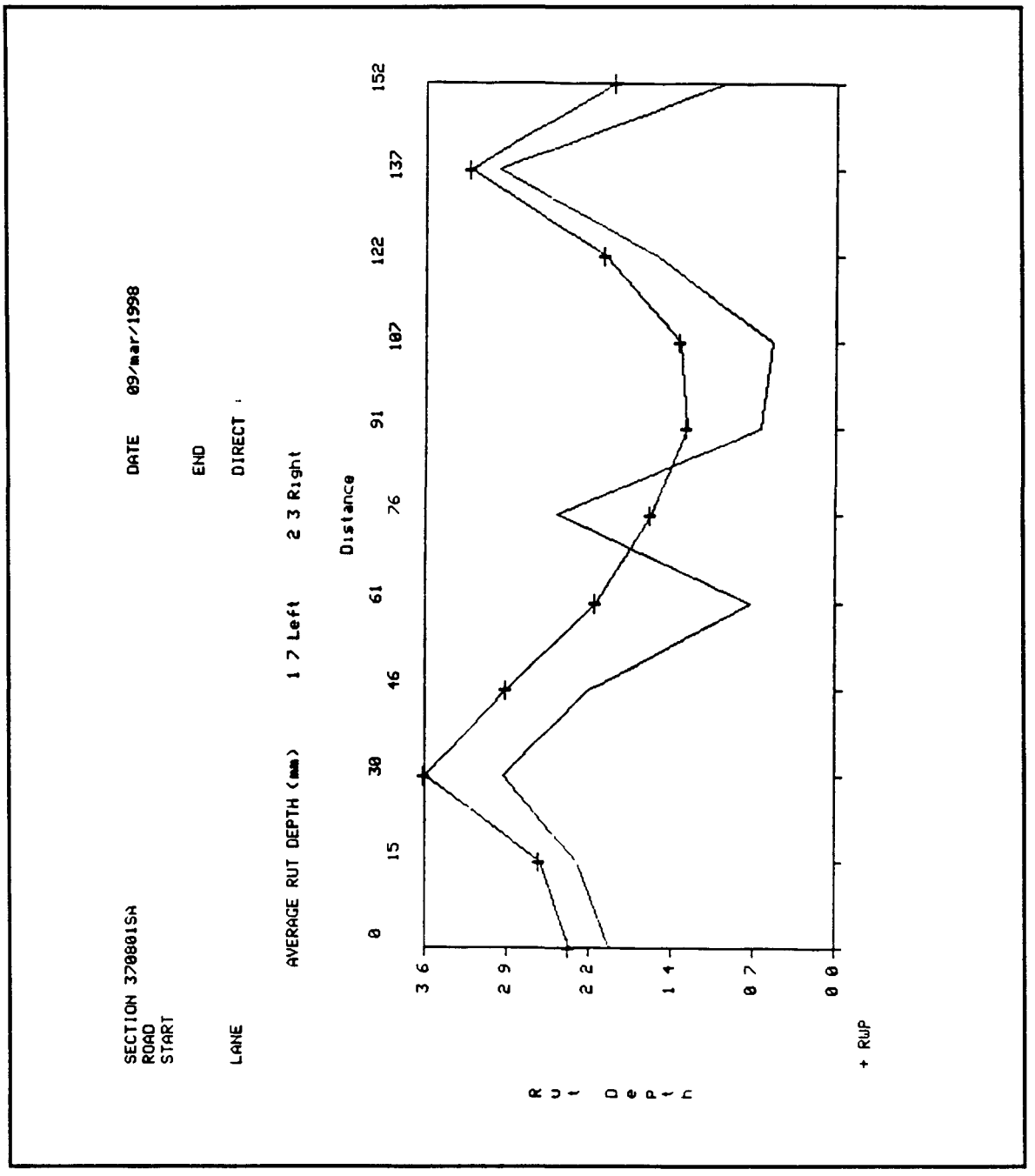


Figure 12. Rut Depth, Section 370801, as Measured by the Dipstick

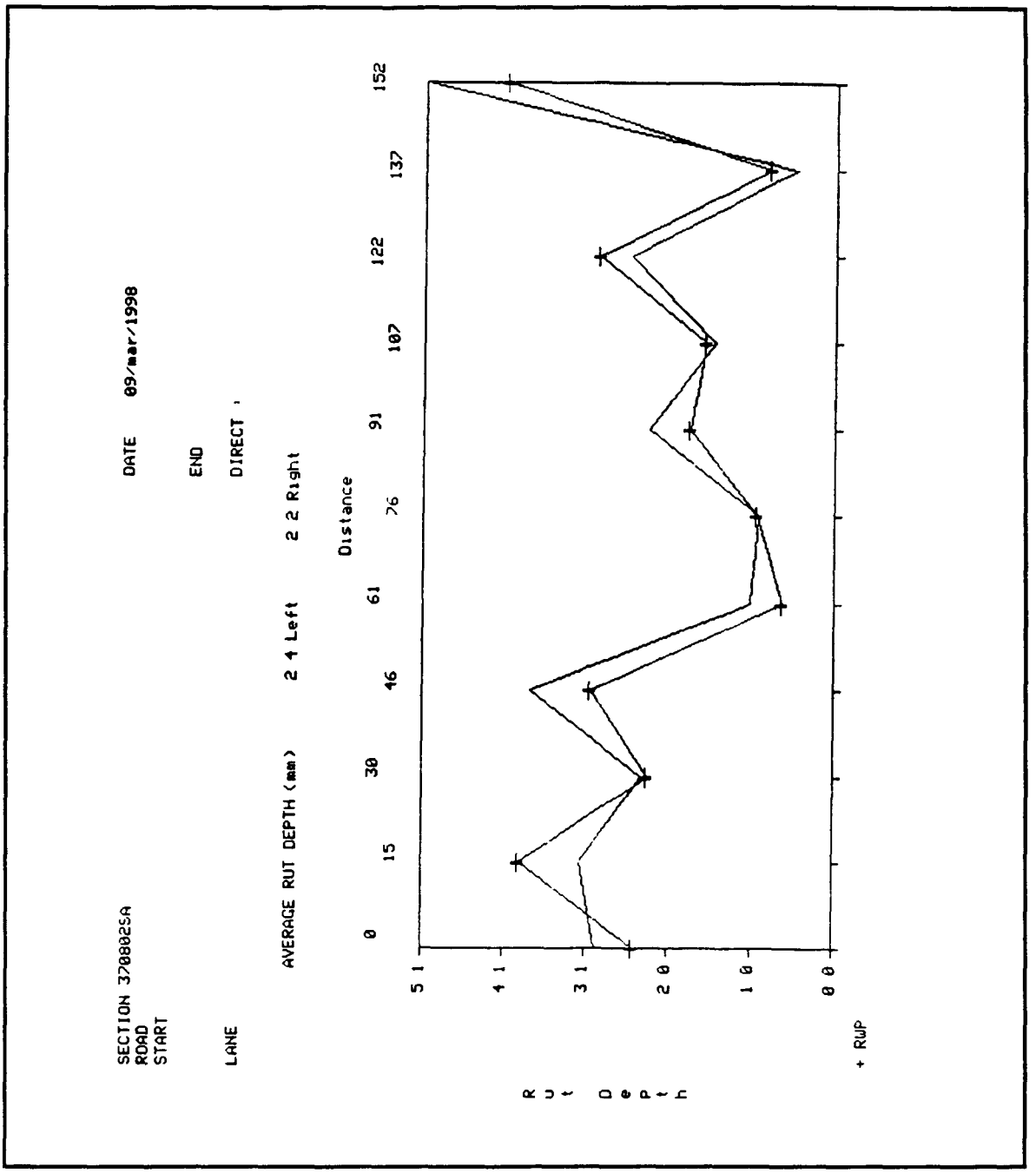


Figure 13. Rut Depth, Section 370802, as Measured by the Dipstick

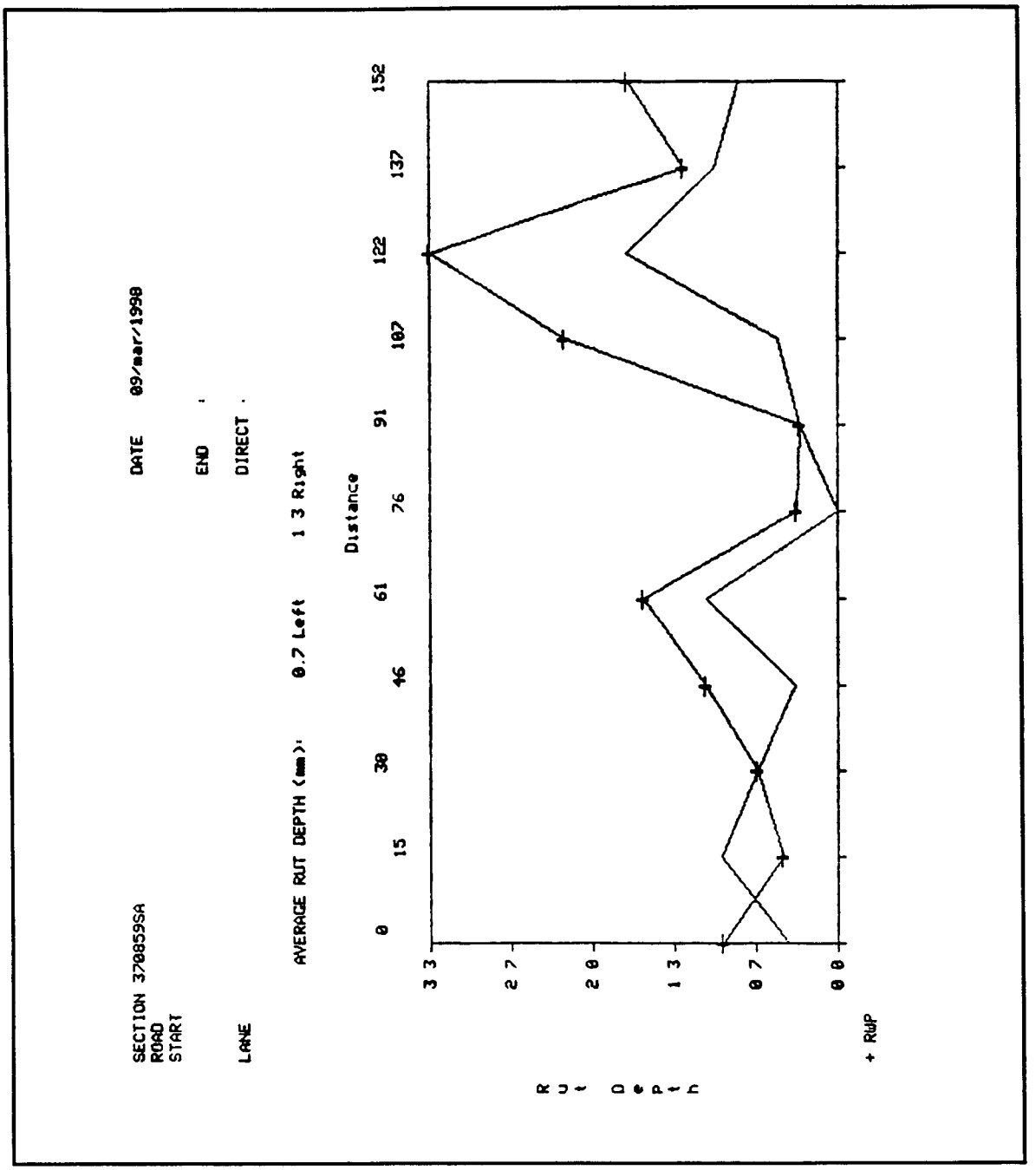


Figure 14. Rut Depth, Section 370859, as Measured by the Dipstick

APPENDIX A

Correspondence, Contract Agreements, Job Mix Formulas, FWD Survey, and SPS Deviation Report

JUL 10 1997

FILE # 13.18.8

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

JAMES B. HUNT JR.
GOVERNOR

DIVISION OF HIGHWAYS
P.O. BOX 25201, RALEIGH, N.C. 27611-5201

GARLAND B. GARRETT JR.
SECRETARY

July 3, 1997

SHRP-LTPP North Atlantic Region Office
c/o ITX Stanley Ltd.
ATTN.: Dr. Bill Phang
415 Lawrence Bell Drive, Unit 3
Amherst, New York 14221-7805

SUBJECT. **SPS-8A**
Study of Environmental Effects in the Absence of Heavy Loads
REVISED Application for Project Nomination

Dear Mr. Phang:

Per your document "... Guidelines for nomination and Evaluation of Candidate Projects for Experiment SPS-8 ...," attached please find **revised** filled out forms containing pertinent information about the project that the North Carolina Department of Transportation (NCDOT) proposes to nominate for candidacy.

The project consists of paving an existing unpaved sparsely traveled, rural residential road, SR 1245, about one-seven tenth mile in length, in Onslow County. Typical secondary road paving standard will consist of six inches of aggregate base course and one and one-half inches of I-2 bituminous concrete surface. The two test sections will be approximately seven hundred feet long, each, with two hundred feet of transition section of typical construction. One test section will be constructed with eight inches of aggregate base course and four inches of bituminous concrete surface. The other test section will be constructed with twelve inches of aggregate base course and seven inches of bituminous concrete surface.

NCDOT will provide a fenced site, with two concrete pads, where an automated weather station may be installed. In consideration of very low volume of traffic at the project, NCDOT will not install a traffic data collection station. Traffic data may be collected on a typical seasonal basis.

I am enclosing an Onslow County map with the project site SR 1245 highlighted.

We look forward to your favorable consideration of nomination for candidacy.

Sincerely,

Mrinmay "Moy" Biswas, Ph.D., P.E.
Pavement and Materials Research Engineer
Research & Development Unit

cc: Distribution (over)

Attachments

Distribution:

Whit Webb, P.E.
Doug Bowers, P.E.
Roger Cates, P.E.
Donnie Huffman
Ken Creech, P.E.
Shin Wu, Ph.D., P.E.
Jim Grady, P.E.
Dick Reaves, P.E.
Frank Pace, P.E.
Pat Strong, P.E.
Monte Symons, P.E. (FHWA)
Max Tate, P E. (FHWA)
Jim Travis (FHWA)
Basel Abukhater

SHEET A. SPS-8 CANDIDATE PROJECT NOMINATION AND INFORMATION FORM

STATE North Carolina SHRP SECTION NO. _____

PROJECT LOCATION

ROUTE NUMBER SR 1245

ROUTE SIGNING [ ] Interstate [ ] U.S. [X] State [ ] County
Other SR (Secondary Road)

PROJECT LOCATION Start Milepost 0.0 End Milepost 0.7
Start Milepost _____ End Milepost _____

DIRECTION OF TRAVEL [X] North B. [ ] South B. [ ] West B. [ ] East B.

PROJECT LOCATION DESCRIPTION 0.7 mile section of Secondary Road 1245, off paved road SR 1209, Onslow County, near Jacksonville

COUNTY Onslow
HIGHWAY AGENCY DISTRICT NUMBER Div. 3, Dist. 1
SHRP ENVIRONMENTAL ZONE
[ ] Wet Freeze [X] Wet No-Freeze [ ] Dry Freeze [ ] Dry No-Freeze

SUBGRADE SOIL CATEGORY
[ ] Active [X] Fine Grained [ ] Coarse Grained

TYPE OF ACTIVITY N/A DEGREE OF ACTIVITY N/A

[ ] Swelling [ ] Frost Heave [ ] Low [ ] Moderate [ ] High

SIGNIFICANT DATES

LATEST DATE OF APPROVAL NOTIFICATION FROM SHRP	July 30, 1997
CONTRACT LETTING DATE	Aug. 15, 1997
ESTIMATED CONSTRUCTION START DATE	Sept. 1, 1997
ESTIMATED DATE TEST SECTIONS OPENED TO TRAFFIC	Nov. 15, 1997
ESTIMATED CONSTRUCTION COMPLETION DATE	Oct. 30, 1997

PROJECT DESCRIPTION

PROJECT TYPE [X] New Route [ ] Removal and Reconstruction
[ ] Parallel Roadway
Other Paving existing gravel road/two lane, undivided/two-way traffic

DESIGN TRAFFIC DATA

ANNUAL AVERAGE DAILY TRAFFIC (TWO DIRECTIONS)	100
% HEAVY TRUCKS AND COMBINATIONS (OF AADT)	1%
ESTIMATED 18K ESAL RATE IN STUDY LANE (1,000 ESAL/YR)	100
TOTAL DESIGN 18K ESAL APPLICATIONS IN DESIGN LANE	2000
DESIGN PERIOD (Years)	20

SHEET B. SPS-8 CANDIDATE PROJECT NOMINATION AND INFORMATION FORM

STATE North Carolina SHRP SECTION NO. _____

AGENCY'S PAVEMENT STRUCTURE DESIGN FOR SITE

LAYER[1] NO.	LAYER[2] DESCRIPTION CODE	MATERIAL TYPE[3] CLASS CODE	THICKNESS[4] (INCHES)	STRUCTURAL[5] COEFFICIENT
1	07	55		
2	05	23	6.0	0.14
3	03	01	1.5	0.44
4				
5				
6				
7				
8				
9				

STRUCTURAL DESIGN METHOD [X] 1972 AASHTO [ ] 1986 AASHTO [ ] Modified AASHTO
Other _____

AASHTO DESIGN RELIABILITY FACTORS R% 50% S_o _____

OUTSIDE SHOULDER TYPE

[X] Turf [ ] Granular [ ] Asphalt Concrete [ ] Surface Treatment
[ ] PCC [ ] Curb and Gutter Other _____

OUTSIDE SHOULDER WIDTH (Feet) 2 ft.

SUBSURFACE EDGE DRAINS [ ] Yes [X] No

NOTES

1. Layer 1 is the natural occurring subgrade soil. The pavement surface will have the largest assigned layer number.

2. Layer description codes:
   Surface Layer..... 03 Base Layer..... 05 Subgrade..... 07
   Subsurface HMAC... 04 Subbase Layer... 06 Embankment (Fill)... 11

3. Refer to Tables 1 through 4 for material class codes.

4. If subgrade depth to a rigid layer is known, enter this depth for subgrade thickness, otherwise leave subgrade layer thickness blank.

5. Enter AASHTO structural layer coefficient value, as appropriately modified, used in pavement design or typical coefficient used by agency for this material. For the subgrade, enter either AASHTO soil support value or resilient modulus value (psi) used in design.

SHEET C. SPS-8 CANDIDATE PROJECT NOMINATION AND INFORMATION FORM

STATE North Carolina SHRP SECTION NO. _____

TEST SECTION LAYOUT

NUMBER OF TEST SECTIONS ENTIRELY ON: FILL N/A CUT N/A

SHORTEST TRANSITION BETWEEN CONSECUTIVE TEST SECTIONS (Feet) 200 ft.

VERTICAL GRADE (Avg %) (+ upgrade; - downgrade) Level

HORIZONTAL CURVATURE (Degrees) [ ] Tangent nominal

COMMENTS ON DEVIATIONS FROM DESIRED SITE LOCATION CRITERIA N/A

OTHER SHRP TEST SECTIONS

FLEXIBLE - DOES AGENCY DESIGN CONFORM TO GPS-1 PROJECT CRITERIA? [ ] Yes [ ] No

RIGID - DOES AGENCY DESIGN CONFORM TO GPS-3 PROJECT CRITERIA? [ ] Yes [ ] No

DISTANCE TO NEAREST GPS TEST SECTION ON SAME ROUTE (Miles) N/A

TEST SECTION NUMBER OF NEAREST GPS SECTION N/A

SUPPLEMENTAL TEST SECTIONS

IF SUPPLEMENTAL EXPERIMENTAL TEST SECTIONS ARE PROPOSED, COMPLETE THE FOLLOWING

TOTAL NUMBER OF SUPPLEMENTAL TEST SECTIONS N/A

FACTORS TO BE INVESTIGATED N/A

ITX Stanley

14 July 1997
File: 50451333-13.18.8

FHWA-LTPP Division
Turner Fairbank Research Center HNR-30
6300 Georgetown Pike, Room F215
McLean, Virginia 22101-2296

Attention: Mr. Monte Symons

Dear Mr. Symons:

Reference: NC SPS-8 Project - Revised Nomination

Dr. Biswas advised that the SPS-8 project site at Swansboro, NC was withdrawn but replaced with a similar site near Jacksonville, NC. SR 1245 is a rural residential unpaved dead-end gravel road, 0.7 miles in length off paved road SR 1209, Onslow County. The layer structures of the revised nomination are the same as for the previously accepted nomination, and the sugrade soil is the same fine grained soil. The project is in the wet no-freeze zone.

The revised nomination project site appears to fit the experiment guidelines. However, traffic will be monitored on a seasonal basis and not by a WIM installation. Arrangements will be made for a weather station to be installed.

Acceptance of the revised nomination is recommended. A response has been requested on or prior to July 30, 1997.

Sincerely,

ITX Stanley Ltd
Pavement Management Systems Division

William A. Phang
LTPP Principal Investigator

Enclosure

cc: W. Bellinger, FHWA-LTPP, w/enclosure
B. Abukhater, NARO, w/o enclosure
E. Lesswing, NARO, w/o enclosure
G. Rada, PCS/Law, w/enclosure

ITX Stanley Ltd 415 Lawrence Bell Drive Suite 3 Amherst NY 14221-7805 Ph (716) 632-0804 Fax (716) 632-4808

LTPP OPERATIONS TEAM

Pavement Performance Division

Federal Highway Administration

Turner- Fairbank Highway Research Center, HNR-40
6300 Georgetown Pike, McLean, Virginia 22101-2296
Telephone (703) 285-2730 Fax (703) 285-2767

FACSIMILE MESSAGE
Number of pages including this cover sheet:

August 28, 1997

TO: Mr. Ed Lesswing
NARCO

FROM: Monte Symons

SUBJECT: NC SPS-8 Nomination

MESSAGE:
Per our telephone conversation on 8-28-97, I have reviewed the proposed change in the North Carolina SPS-8 from the Swanboro location to SR 1245 near Jacksonville. This change is acceptable. Please notify the appropriate state personnel.

Monte Symons

cc:
B. Bellinger

FILE MEMORANDUM (Minutes)

DATE: August 28, 1997
FROM: Mustansir Kadibhai
SUBJECT: SHRP SPS-8 meeting at Division 3, District 1
cc: Distribution

To discuss the SHRP Special Pavement Studies for Experiment SPS-8, "Study of Environmental Effects in the Absence of Heavy Loads," a meeting was held at the NCDOT Division 3, District 1 Engineer's office in Jacksonville on Thursday, June 5, 1997.

The following persons attended the meeting:

Roger Cates	Div. 3, Maintenance
Donnie Huffman	Div. 3, Dist. 1
Patrick Riddle	Div. 3, Dist. 1
Basel Abukhater	ITX Stanley / NARO
Jim Travis	FHWA/ Raleigh
Pat Strong	R & D Unit
Moy Biswas	R & D Unit
Mustansir Kadibhai	R & D Unit

The previously selected SR 1431 (near Swansboro) being no longer available, the objective of the meeting was to select an alternative project. Donnie Huffman suggested two projects that may considered for SPS 8:

(i) SR 1245, approximately 3 miles away from the Albert Ellis airport in Jacksonville, and

(ii) SR 1565, near Swansboro

The construction of the Jacksonville project is imminent (Fall, 1997). The construction of Swansboro project will not start before Spring 1998. Also, the later route leads to a trailer park and would encounter relatively greater volume of traffic than what will be suitable for the SPS-8 study. Hence, the Jacksonville project was selected for the SPS-8 experiment. For this project, NCDOT will need to submit a revised application for nomination to LTPP-NARO

The following is a summary of discussions that ensued:

The experiment will include three test sections @ 700 ft. each·

- 6" ABC + 1½ " Surface (I-2)
- 8" ABC + 4" HMAC [2½ " Binder (H) – 1½ " Surface (I-2)]
- 12" ABC + 7" HMAC [3" Base (HB) +2½ " Binder (H) –1½ " Surface (I-2)]

The pavement will be 24 ft. wide full depth. The pavement will have two travel lanes striped @ 10 ft. width, and 2 ft. width remaining as shoulders one each side. This is a slight deviation from the requirement of 12 ft. lane width and will be noted as such.

Regarding weather station, question was raised if we could use the weather data that would be available from the weather station of the airport nearby. Via telephone, Bill Phang of ITX-Stanley, Amherst, NY, said that the airport weather station data is not in conformance with the LTPP format and an AWS (Automated Weather Station) dedicated for the project will be needed. Donnie Huffman said that the District will have some land available near the airport, which can be used for installing the weather station. Per sketches provided by ITX-Stanley, NCDOT will provide a fenced area of 20 ft. x 20 ft. and two concrete pads, 2 ft. x 2 ft. each. ITX-Stanley will provide all AWS instruments and installation thereof.

Regarding paving materials and paving construction, the following points were discussed:

(1) The construction guidelines for HMAC requires Marshall Specifications as: Blow count: 75; Stability: 1800 lb.; Flow: 8-14; Air Voids: 3 - 5%. Although these are different from (higher than) NCDOT standard specifications, such numbers can be specified for the subject project by way of Special Provisions.

(2) The 12" ABC should be compacted in two equal layers.

(3) No RAP will be used.

(4) There should be no transverse joints in the test sections.

(5) Longitudinal joints should be located within 1 ft. of pavement center line.

(6) Total HMAC thickness should be within ¼" tolerance.

(7) Subgrade density and tolerance should comply with the LTPP *Construction Guidelines*

(8) ABC density and tolerance should comply with the LTPP *Construction Guidelines*

R&D and ITX-Stanley would like to have preliminary schedule of upcoming construction activities at least two weeks ahead and more firm schedule about a week ahead

FWD testing will be performed after completion of subgrade, as well as after completion of ABC and the surface course. On account of the small size of the project, construction of all layers of the project is likely to be completed in a relative short period of time. It may not be possible for ITX-Stanley to have their FWD brought to the site in time. ITX-Stanley requested that NCDOT would provide a FWD equipment. Regarding the operation of NCDOT FWD equipment, ITX-Stanley will have a technician available to work with and assist the NCDOT operator.

A temporary storage area will be needed to keep material samples and specimens that will be collected for subsequent shipping to Law Engineering (Atlanta, Ga.), Materials Reference Library (MRL, Reno, Nv.) and NCDOT M&T Lab. (Raleigh).

The material samples and specimens will be collected and kept at the Onslow County Maintenance Yard. The containers from MRL (3 buckets only) should be sent to, as well as picked up from:

Attn.: Mr. Billy Dixon
NCDOT- Onslow County Maintenance Yard
299 Wilmington Highway
Jacksonville, NC 28540

Also, ITX-Stanley and R&D personnel will need a temporary work space during the project construction and monitoring periods.

Aggregates for the project is expected to be from the Maple Hill quarry of Martin Marietta/East Coast Stone.

Eight 4 inch diameter cores per test section (total 24 cores) will be taken four to eight weeks after completion of construction. During coring, lane closure and traffic control will be needed.

By way of attachments, copies of preliminary listing of sequence of events regarding materials sampling and monitoring was distributed and reviewed. (A final list of activities and details of plans of materials sampling, testing and evaluation will be distributed at a later date)

Upon completion of the meeting, Messrs. Pat Strong, Basel Abukhater, Moy Biswas, and Mustan Kadibhai, visited the project site and also the prospective site for AWS. The existing SR 1245 indicated the presence of a sharp horizontal curve as it is shown on the county map. Mr. Abukhater indicated that the three test sections of the SPS-8 experiment could be accommodated within the project.

Distribution:

Attendees
Dick Reaves, P E.
Cecil Jones, P E.
Shin Wu, Ph. D., P E.
Judith Corley-Lay, Ph. D , P E.
Jim Grady, P E.
Jim Trogdon, P E.
Bill Phang, D. Sc.
Max Tate, P E. (FHWA-Raleigh)

SEP 15 [illegible]

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

JAMES B. HUNT JR.
GOVERNOR

DIVISION OF HIGHWAYS
PO BOX 25201 RALEIGH N C 27611-5201

GARLAND B. GARRETT JR.
SECRETARY

Memorandum

DATE: September 8, 1997

TO: Donnie Huffman
Shin Wu
Basel Abukhater
Jim Travis
Pat Strong
Moy Biswas
Mustansir Kadibhai
Patrick Cella

FROM: Mrinmay (Moy) Biswas

RE: SHRP Special Pavement Study (SPS) 8
SR 1245 Pavement Test Sections, Onslow county

CC: Roger Cates
Dick Reaves
Cecil Jones
Carson Clippard
Bill Medford
Phil Stanberry
Mehdi Haeri
Ken Creech
Judith Corley-Lay
Jim Grady
Njoroge Wainaina
Jim Trogdon
Bill Phang
Max Tate

To discuss further details of construction guidelines, and materials sampling & testing plan, we have arranged a meeting at the office of Mr. Donnie Huffman, District Engineer, Division 3, District 1, 410 New Bridge Street, Suite 7-A, Jacksonville, NC 28540, Phone (910) 346-2040, FAX. (910) 346-8030

We will appreciate your attendance and participation at this meeting.

ITX Stanley

FAX TRANSMITTAL

To:	NC DOT	**Fax No.**	919/715-0137
Attention:	Dr. "Moy" Biswas	**Date:**	15 September 1997
Reference:	**SPS-8 Project 370800, SR 1245 Jacksonville, NC FILE: 50451319-13.18.8**	3 page(s) total including cover sheet. Original will **NOT** follow by mail.	
Sender:	Bill Phang		

MESSAGE:

At the SPS-8 Meeting 9/12/97, B. Abukhater indicated that the NC specifications in Table 1005-1 for Aggregate Base Course (ABC) may not necessarily conform with the SPS-8 Construction Guidelines. It would be appreciated if the Special Provisions of the Contract would include the attached Aggregate Requirements of the SPS-8 Construction Guidelines, and as well the Construction Requirements which follow.

B. Abukhater also reported the NC DOT intention of avoiding use of a prime coat on the granular base as described in the Construction Requirement because of likely tracking of the material into nearby homes. Would you consider using a very dilute emulsion prime covered with damp sand immediately and then compacted with a rubber tire roller as a means of reducing the probability of tracking?

Thank you for giving consideration to these suggestions.

ITX Stanley Ltd.
Pavement Management Systems Division

William A. Phang
LTPP Principal Investigator

Copies E. Lesswing, NARO
B. Abukhater, NARO

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

JAMES B. HUNT JR.
GOVERNOR

DIVISION OF HIGHWAYS
PO BOX 25201 RALEIGH N C 27611-5201

GARLAND B. GARRETT JR.
SECRETARY

Memorandum

DATE: September 15, 1997

TO: Dr. Judith Corley-Lay, P E

FROM: Mrinmay (Moy) Biswas

RE: SHRP Specific Pavement Study (SPS) 8
SR 1245 Pavement Test Sections, Onslow county

CC: Donnie Huffman
Patrick Riddle
Billy Dixon
Shin Wu
Bill Phang
Basel Abukhater
Pat Strong
Mustan Kadibhai

The upcoming schedule of events for the subject project is as follows:

Preparation of **Subgrade** (by NCDOT Maintenance force): week of **Oct. 6**, 1997
Preparation of **ABC** (by NCDOT Maintenance force): week of **Oct. 13**, 1997
Contract **Letting**: **Oct. 15**, 1997
Site available to the Contractor: **Oct. 20**, 1997
Project **Completion** window: **60 days**. (by **Dec. 18**, 1997)

The SPS-8 experiment requires FWD tests (1) after completion of subgrade, (2) after completion of ABC, and (3) once during a period of 4 to 8 weeks after completion of paving. ITX-Stanley has indicated that their FWD may not be available during these time frames and requested NCDOT to provide an FWD. ITX-Stanley will a provide a technician to work with our FWD operator

This is to request you to schedule an FWD during the weeks of Oct. 6, Oct. 13, and some time during the last week of January 1997 or the first week of February 1997

The office of Division 3, District 1 will let us know about the exact dates when the site will be available for FWD testing and ITX-Stanley will let us know if they would, in fact, need our FWD on those dates.

As soon as I find out about specific needs and respective dates, I will let you know

Thank you very much.

ITX Stanley

FAX MEMORANDUM

TO:	Doug Frith	(702) 329-5098
FROM:	Basel Abukhater BA	(519) 622-2580
ATE:	22 September, 1997	
REFERENCE:	Shipping Containers to NC DOT	
	FILE: 5-045-13-19	

Sept 22/97.

155

NC DOT will be starting their SPS-8 construction early next month They have asked us to get in touch with you to ship them the necessary containers for sampling the aggregate, hot mix, and asphalt cement material as soon as possible

The following lists the material to be sampled, required quantity, and type of containers that are needed for this ob

Hot Mix Asphalt Concrete Mixes	18-19 litre (5 gal) pails	Special Epoxy line metal pails and covers
Combined Aggregate (Uncoated)	33-19 litre (5 gal) pails	Polyethylene pails and covers
Asphalt Cement Binder	3-19 litre (5 gal) pails	Special Epoxy line metal pails and covers

iese 54 pails should go to the following name and address

Mr Billy Dixon
NCDOT - Onslow County Maintenance Yard
299 Wilmington Highway
Jacksonville, NC 28540

Phone (910) 455-3777
Fax (910) 455-3948

Any questions please call at (519) 622-3005 or fax (519) 622-2580

cc M Biswas NCDOT
B Phang, NARO
E Lesswing, NARO

ITX Stanley Ltd 415 Lawrence Bell Drive, Suite #3, Amherst NY 14221 Ph (716) 632-0804 Fax (716) 632-4808

ITX Stanley

INTERNAL MEMORANDUM

TO: File

FROM: Ed Lesswing

DATE: 30 September 1997

REFERENCE: SPS-8 Project, SR 1245 NB, Jacksonville, NC
FILE: 50451319-13.18.8

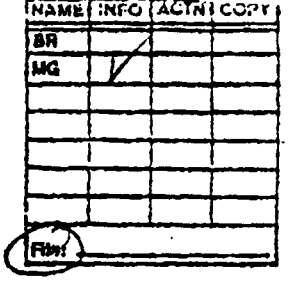
Pat Strong of NC DOT called September 29, 1997 to ask if their QMS (Quality Materials System) procedures could be waived for the above project.

He was told that one of the Highway Agency requirements was to "provide construction control, inspection and management in accordance with their standard quality control and assurance procedures". If they would normally waive QMS on a job of this size they were free to follow those normal procedures. However, they should not waive the QMS procedures just because this is an LTPP project.

Ed Lesswing
LTPP Co-Principal Investigator

cc: W.A. Phang, P.I.-NARO
B. Abukhater, NARO

ITX Stanley Ltd 415 Lawrence Bell Drive, Suite 3 Amherst, New York 14221-7805 Ph (716)632-0804, Fax (716)632-4808



RECEIVED APR 1 7 1998

Memorandum

U.S. Department
of Transportation

6300 Georgetown Pike
McLean, Virginia 22101-2296

Federal Highway Administration

HNR30-0498-9AN-004

Subject: ACTION: Transfer of Obligation Authority
LTPP SPS Incentive Funds

Date:

From: Charles J. Nemmers, Director
Office of Engineering
Research and Development (HNR-1)

Reply to
Attn of: HNR-30

To: Mr. Nicholas L. Graf
Division Administrator, (HDA-NC)
THROUGH: Mr. Leon N. Larson
Regional Administrator (HRA-04)

This is to confirm the release of incentive funds to the North Carolina Department of Transportation for test sections in the Specific Pavement Studies (SPS) of the Long Term Pavement Performance program. The incentive funds are to be used in conjunction with the following conditions and specific activities associated with LTPP SPS experiment and test sections:

1. The North Carolina Department of Transportation's continued agreement to conform to all of the design and participation requirements of the experiment.

2. Reimbursement of costs associated with: (a) the purchase and/or installation of weigh-in-motion and/or automated vehicle classification equipment; (b) conventional sampling and materials testing; and/or traffic control expenditures that are incurred as part of data collection activities.

The Federal share for the first $30,000 of the above work is 100 percent. Costs in excess of $30,000 may be eligible for reimbursement as part of the regular Federal-aid construction and/or research programs. This transfer of obligation authority also increases North Carolina Department of Transportation obligation limit by $30,000.

Appropriation Code: 9AN ($30,000)
(3C6a-8213)

Fiscal Management Information System (FMIS) procedures are to be used.

Funds are to be used for the following sections:

SPS-8	SR 1245 near Jacksonville	30,000
	TOTAL	$30,000

"These funds are subject to the overall FY 1998 Federal-aid Highways obligation limit. The funds will be withdrawn on September 1, 1998, if unobligated at that time."

Procurement Integrity: "The Long Term Pavement Performance Division staff named in this memorandum have executed the required 'procurement official' certification in accordance with section 27 of the Office of Federal Procurement Policy Act, as amended (P.L. 100-679)."

Upon receipt of this memorandum, please notify the North Carolina Department of Transportation, and establish the appropriate accounts.

If there are any questions, you may call Mr. Monte Symons at 703-285-2730.

Charles J. Nemmers, P.E.

FHWA:HNR-30:msymons:mtm:285-2730:4/8/98
Location:c\mpesut\wp\incent.ltrs\incent.nc
cc:
HFS-23
HFS-10 P. McAleer
R&D Reading
HRD-10, R. Collins
HNR-1
SPS Project File
LTPP Region
Official File (150.00)
Chron

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

JAMES B. HUNT JR.
GOVERNOR

PO BOX 25201 RALEIGH NC 27611-5201

E. NORRIS TOLSON
SECRETARY

Memorandum

DATE: June 12, 1998

TO: Dick Reaves, P E.

FROM: Mrinmay (Moy) Biswas

RE: SHRP Specific Pavement Study (SPS) 8
"Study of Environmental Effects in the Absence of Heavy Loads"
SR 1245 Pavement Test Sections, Onslow county

CC:

Donnie Huffman
Cecil Jones, P E.
Mehdi Haeri
Carson Clippard, P E.
Bill Medford
Ken Creech, P E
George Gibson, P E.
Shin Wu, Ph D., P E.
Judith Corley-Lay, Ph D., P E.
Jim Grady, P E.
Jim Trogdon, P E.
Bill Phang, D.Sc.
Basel Abukhater
Billy Dixon
Patrick Riddle
Max Tate, P E.
Jim Travis, P.E.
Pat Strong, P E.

The construction of SR 1245 incorporating the three SPS 8 test sections, an automated weather station, as well as collection of all material samples, has been completed.

One batch of material samples has been shipped to the FHWA Material Reference Library (MRL) c/o Nichols Consulting Engineers in Reno, Nevada. A second batch of materials has been shipped to the FHWA LTPP testing Lab: Braun/Intertec of Minneapolis, Minnesota.

In addition, a third batch has been brought to the M&T Lab. in Raleigh. The latter includes subgrade, ABC, asphalt mix, asphalt pavement cores, and liquid asphalt binder samples.

Attached please find a listing of testing to be performed by the Agency (NCDOT)

We appreciate the participation of your laboratories in performing these tests.

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

JAMES B. HUNT JR.
GOVERNOR

DIVISION OF HIGHWAYS

GARLAND B. GARRETT JR.
SECRETARY

DIVISION 3 DISTRICT 1
410 NEW BRIDGE ST., SUITE 7-A
JACKSONVILLE, NC 28540

OCTOBER 1, 1997

NOTICE TO PROSPECTIVE BIDDERS

Subject: Invitation to Bid on Division Contracts

- ***Project Description:*** **SHRP SPECIAL PAVEMENT STUDY (SPS) 8A**
  SR 1245 PAVEMENT TEST SECTIONS

Work Order Number: ***6.262328***

The North Carolina Department of Transportation is requesting bids for the conditioning and paving of SR 1245, in Onslow County. The project will include approximately 10,640 SY of Conditioning Existing Base, 325 Tons of ACBC, Type HB, 540 Tons of ACBC, Type H, & 850 Tons of ACSC, Type I-2. The Contractor is to furnish labor, material, equipment, and traffic control.

The availability date for this project is October 20, 1997. The completion date is December 12, 1997.

Sealed bids must be received in the Jacksonville District Engineer's Office located at 410 New Bridge St., Suite 7-A, Jacksonville, NC 28540 by 10:00 AM on the 15th day of October, 1997. Bids must be submitted on the official bid sheet included in the proposal and display the following statement on the front of the envelope:

"QUOTATION FOR WORK ORDER 6.262328 - CONDITION AND PAVE SR 1245 FROM SR 1209 TO CUL-DE-SAC, LOCATED IN ONSLOW COUNTY TO BE OPENED AT 10:00 AM ON THE 15TH DAY OF OCTOBER, 1997."

The North Carolina Department of Transportation , in accordance with the provisions of Title VI of the Civil Rights of 1964 (78 Stat.252) and the Regulations of the Department of Transportation (49 C.F.R., Part 21), issued pursuant to such act, hereby notifies all bidders that it will affirmatively insure that the contract entered into pursuant to this notice will be awarded to the lowest responsible bidder without discrimination on the grounds of sex, race, color, or national origin.

Statements of Minority and Women Business Enterprises participation must be *presented with the bids.*

A mandatory Prebid Conference will be held in the NCDOT Jacksonville District Engineer's Office located at 410 New Bridge St., Suite 7-A, Jacksonville, NC 28540 on the 8th day of October, 1997 at 2:00 PM to review the project with all interested bidders. Attendance is required in order to be eligible to bid on this project.

Proposals may be obtained at the **NCDOT Jacksonville District Engineer's Office located at 410 New Bridge St., Suite 7-A, Jacksonville, NC 28540.** Please refer to the Work Order referenced when making requests or inquiries regarding this project. If you have questions, or need additional information concerning this project, please contact C. W. Wethington, Jr., Transportation Technician IV, at (910) 346-2040.

Sincerely,

D. R. Huffman
District Engineer

DRH/cww
cc: R. W. Cates, P.E., Division Maint. Eng.
Mrinmay (Moy) Biswas, PH. D., P.E., Pvmt. & Mat. Research Eng.
B. B. Dixon, County Maint. Supv.

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

DIVISION 3 DISTRICT 1
410 NEW BRIDGE ST., SUITE 7-A
JACKSONVILLE, NC 28540
OCTOBER 16, 1997

BARRUS CONSTRUCTION CO.,
DIVISION OF APAC-CAROLINA, INC.
PO BOX 399
KINSTON, NC 28502

SUBJECT: Work Order 6.262328 - Condition & Pave SR 1245, Onslow County.

Dear Gentlemen,

Bids for work order 6.262328 was opened October 15, 1997. Your firm presented the low bid ($103,980.20) and I have recommended that you be awarded the contract.

A purchase order will be issued upon receipt of the required one hundred percent (100%) payment bond, and one hundred percent (100%) performance bond

Please contact Warren Wethington of my office to schedule work on this project The availability date is Monday October 20, 1997.

I am looking forward to your successful completion of this project. Please call my office at 910-346-2040 if I can be of further assistance.

Sincerely, (cww)

D. R. Huffman

D. R. Huffman, District Engineer

DRH/cww

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

DIVISION 3 DISTRICT 1
410 NEW BRIDGE ST., SUITE 7-A
JACKSONVILLE, NC 28540
OCTOBER 17, 1997

Memo To: D. J. Bowers, PE

From: D. R. Huffman

Project: 6.262328
County: Onslow
Description: Condition existing base & pave SR 1245.

Subject: Requisition No. 989805

Enclosed you will find the original bid sheets, a copy of the project specifications for the above mentioned project, and the purchase requisition. Barrus Construction Co., Division of APAC-Carolina, Inc. is the low bidder on this project, and I recommend that they be awarded the contract.

100% Performance Bond and 100% Payment Bond to be forwarded upon receipt.

I am requesting verbal approval for subject requisition, as the availability date is scheduled for October 20, 1997, and the Contractor is ready to begin work.

If I can provide any additional assistance, or if you have any questions, please contact me.

DRH/cww

Enclosures

North Carolina Department of Transportation
CONTRACT BID FORM

Work Order Number: 6.262328
Description: CONDITION, & PAVE SR 1245
County: ONSLOW

ITEM	SECT	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	AMOUNT BID
1	535	Condition Existing Base	10.64	MSY	680.20	7235.20
2	609	QMS, Asphalt Plant Mix Pavements	1715	TON	1.50	2572.50
3	645	ACSC, Type I-2	850	TON	50.50	42925.00
4	645	ACBC, Type H	540	TON	61.50	33210.00
5	645	ACBC, Type HB	325	TON	55.50	18037.50

TOTAL BID FOR PROJECT: $103,980.20

CONTRACTOR Barrus Construction Company, Division of APAC-Carolina, Inc.

ADDRESS Post Office Box 399, Kinston, North Carolina 28502

Federal Identification Number 58-1401474 Contractors License Number 12459

Authorized Agent T. Edward Briley, Jr. Title Authorized Employee

Signature T. Edward Briley Jr Date 10-15-97

Witness Janet W. Barefoot Title Assistant Secretary

Signature Janet W. Barefoot Date 10-15-97

THIS SECTION TO BE COMPLETED BY NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

This bid has been reviewed in accordance with Article 103-1 of the Standard Specifications for Roads and Structures July 1995 English.

Reviewed by C.W. Wooten Jr. 10-15-97 *(date)*

Accepted by NCDOT D.K. Hughes Dist. *Engineer* 10-15-97 *(date)*

North Carolina Department of Transportation
DIVISION CONTRACT BID SUMMARY

Bid Opening Date: October 15, 1997 Time: 10:00 AM
Work Order Number: 6.262328
Description: Special Pavement Test Study, SR 1245, in Onslow County.

Contractor	Amount Bid
Barnes Construction	103,980.20 · 9:47 AM

Total Bids Received 1

Bids opened by: C.W.W. Jr. Title TI IV

Witness: A. S. Sylvear Title OA TV

\forms\bidsum dvc

NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
PURCHASING DEPARTMENT
RALEIGH, N. C. 27611

P TO:

C. DEPT OF TRANSPORTATION
R. HUFFMAN, DIST. ENGR.
0 NEW BRIDGE DR., SUITE 7-A
CKSONVILLE, N. C. 28540

HARRUS CONSTRUCTION CO.
DIV. OF APAC-CAROLINA, INC.
BOX 399
KINSTON, NC 28502

REQUISITION NO.	PURCHASE ORDER
9898057	961037

BOTH ABOVE NUMBERS MUST APPEAR ON ALL INVOICES, SHIPPING PAPERS AND SHIPMENTS. SEE REVERSE SIDE FOR ADDITIONAL INSTRUCTIONS.

DATE	PAGE
10/28/97	01

DELIVER-VIA: CONTRACTOR

VENDOR NO.	DEPT.	OBJ.	WO/JO/EQ.NO.	FUNC.	CB	PCT.	TERMS
581401474C ENGR. 3	43031	357	6262328	392		100	

CERT. BID OR QUOTE	F.O.B.
CONTRACT	

4 PLEASE ENTER OUR ORDER AS FOLLOWS (FOR IMMEDIATE SHIPMENT VIA CHEAPEST WAY UNLESS SPECIFIED) DO NOT SHIP COLLECT, SUBJECT TO TERMS ON BACK.

M	QUANTITY	UNIT	DOT/COMM. NO.	MFG. NO. SIZE AND DESCRIPTION	UNIT PRICE	TOTAL NET PRICE
1	10640	SY	70-00300 218	CONDITION EXISTING BASE		
2	1715	TON	70-00300 218	QMS, ASPHALT PLANT MIX PAVEMENTS		
3	850	TON	70-00300 218	ACSC, TYPE I-2		
4	540	TON	70-00300 218	ACBC, TYPE II		
5	325	TON	70-00300 218	ACBC, TYPE HB		
				CONDITION EXISTING BASE & PAVE SR 1245 FROM SR 1209 TO CUL-DE-SAC LOCATED IN ONSLOW COUNTY.		
				BEGINNING DATE: 10-20-97 COMPLETION DATE: 12-12-97 LIQUIDATED DAMAGES: $100.00 PER CALENDAR DAY		
				NOTE TO CONTRACTOR: ALL INVOICES & DELIVERY TICKETS MUST BE SUBMITTED IN TRIPLICATE TO: D. R. HUFFMAN, DIST. ENGR. 410 NEW BRIDGE ST., SUITE 7-A JACKSONVILLE, NC 28540		
				INSURANCE CLAUSE ATTACHED.		

A-25

REPORT MUST BE SIGNED
DATED. THE ABOVE ITEMS OR MATERIAL RECEIVED

BY: _____ DATE _____
SIGNATURE

B P BARKER

ARRUS CONSTRUCTION COMPANY
APAC-CAROLINA, INC.

Post Office Box 399 • Kinston, North Carolina 28502-0399
Ph. 919-527-8021 • Fax 919-527-4739

October 29, 1997

Mr. D.R. Huffman
North Carolina Department of Transportation
Division 3 District 1
410 New Bridge Street, Suite 7-A
Jacksonville, NC 28540

Re: (SPS) Condition & Pave SR 1245
Onslow Co. Work Order 6.26328
Additional Funds

Mr. Huffman:

Barrus Construction Company respectfully requests additional funds on the referenced project due to additional 2" stone placed after initial grading was performed.

We request additional conditioning of existing base in the amount of 9 5 MSY, payment at the unit cost of $680.00/MSY We are not requesting any time extension for this work.

Sincerely,

BARRUS CONSTRUCTION COMPANY
Division of APAC-Carolina, Inc

Chester F Harrison
Area Manager

CFH mp

file

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

JAMES B. HUNT JR.
GOVERNOR

DIVISION OF HIGHWAYS
410 New Bridge Street
Suite 7-A
Jacksonville, NC 28540

GARLAND B. GARRETT JR.
SECRETARY

October 30, 1997

Division 3
District 1
Onslow County

Barrus Construction Company
Division of APAC-Carolina, Inc.
Post office Box 399
Kinston, NC 28502-0399

Att: Mr. Chester F. Harrison

Subject: (SPS) Condition & Pave SR 1245, Onslow County
Work Order 6.262328, Additional Funding

Dear Mr. Harrison,

In your letter dated October 29, 1997 you have request additional funding for the above mentioned project. Your company had conditioned 9.5 MSY of base prior to the Division of Highways determination that an additional 2" of ABC was need for this project. You also asked that payment be made at the unit bid cost of $680.00 per MSY and that no extension of time was requested.

The Division of Highways has noted in our pay record book the 9.5 MSY was conditioned and when you have reconditioned this project we will enter the total project quantity of 10.64 MSY at that time. This will show the total quantity for "Condition Existing Base" to be 20.14 MSY. Please note this quantity when you request final payment for this work.

If you have any further questions or if I can be of further assistance to you, please advise.

Respectfully,

D. R. Huffman
District Engineer

cc: Billy Dixon

HOT MIX ASPHALT JOB MIX FORMULA

BARRUS CONSTRUCTION

DEPPE, NC

PLANT CERTIFICATION NO: B -055

TYPE MIX: BCBC, TYPE HB

JOB MIX FORM NO: 97-706-021

EFFECTIVE DATE: 12-05-97

PROJECT NO: 631

COUNTY:

AGGREGATE SOURCES AND BLEND PERCENTAGES

SUPPLIER	LOCATION/SOURCE	MATERIAL	BLEND (%)
MARTIN MARIETTA	CLARKS QUARRY	#4	32.0
MARTIN MARIETTA	BELGRADE QUARRY	78M	42.0
MARTIN MARIETTA	BELGRADE QUARRY	C.SCRGS.	16.0
BARRUS CONSTR.	ANDERSON PIT	SAND	10.0
		TOTAL	100.0%

JMF COMBINED GRADATION SIEVE SIZE	% PASSING
2 "	100
1 1/2"	95
1 "	
3/4"	72
1/2"	
3/8"	
NO. 4	45
8	30
16	25
40	16
80	
NO. 200	3.0

ASPHALT CEMENT %(TOT)	4.9
GRADE	PG64-22
TEST ASH	
MAX. SP. GV.	2.311
LABORATORY SP. GV.	2.219
VOIDS IN TOTAL MIX %	4.0
MIN. % COMPACTION	92.0
MIX TEMPERATURE F.	300
FLOW (0.01 IN.)	18
STABILITY (LBS.)	5130
NON STRIP ADDITIVE %	0.25
MODIFIER %	0.00

ASPHALT CEMENT SUPPLIER: TRUMBULL MOREHEAD CITY
TACK COAT SUPPLIER : SPECS.
NON-STRIP ADD. SUPPLIER: ARR-MAZ LOT 65-00
MODIFIER SUPPLIER :

COMMENTS: TRADE SECRET

DATE JMF VOID:

APPROVED BY:
J.E. GRADY, JR.
PAVEMENT CONSTRUCTION ENGR.

END REQUEST#=000101 DATE=12/05/97 TIME=14.33.02 LINES OUT=000062

REVISED 4/1/97

BARRUS CONSTRUCTION COMPANY
APAC-CAROLINA, INC.
KINSTON, N.C.

MST FORM 001

REPORT ON MIX DESIGN OF ASPHALT MIXTURE
North Carolina Department Of Transportation

MD# _____

DATE SAMPLED:	10/28/97	DATE APPROVED:	
PROJECT NO.:	6.262328	ASPHALT: Trumbull Morehead City	PG64-22
COUNTY:	ONSLOW	ADDITIVE: ARR-MAZ LOF 65-00	(.25 %)
CONTRACTOR:	BARRUS CONST. CO.	Martin Marietta / Clarks	# 4 Stone
PLANT LOC.:	DEPPE	Martin Marietta / Belgrade	78-M Stone
PLANT CERT. #:	B-055	Martin Marietta / Belgrade	Concrete Scrgs.
DESIGNED BY:	SHANE JOHNSON	BARRUS / ANDERSON	Natural Sand
SPECIFICATION:	HB		
MARSHALL:	300 °F 6 Inch 75 Blows		
AC SPECIFIC GRAVITY:	1.030		

GRADATION OF MATERIALS USED

MATERIAL	#4	78M	C	RG	SAND		Bghouse	RAP	BLEND	Spec.
PERCENT	32.0	42.0		1.0	10.0		1.0	0.0	100.0	Range
2"	100.0	100.0		0.0	100.0		100.0		100	100
1 1/2"	96.0	100.0		0.0	100.0		100.0		99	95-100
1"	41.0	100.0		0.0	100.0		100.0		81	
3/4"	11.0	100.0		0.0	100.0		100.0		72	68-82
1/2"	8.0	99.0		0.0	100.0		100.0		70	
3/8"	8.0	88.0		0.0	100.0		100.0		66	
#4	7.0	40.0	1	0.0	100.0		100.0		45	32-46
#8	6.0	11.0		0	97.0		100.0		30	28-44
#16	6.0	7.0		0	88.0		100.0		25	20-32
#40	5.0	6.0		0	41.0		100.0		16	11-20
#80	4.0	3.0		0	4.0		100.0		5	
#200	2.0	2.0		7	0.7		90.0		3.0	3.0-5.0
ELUT. LOSS					0.7				0.1	0.0-4.0
AGG. B.S.G.	2.259	2.483	2	2	2.627		2.800		2.439	
								EFF. S.G..	2.469	

FORMULATIONS

	MIX #1	MI	#2	MIX #3	MIX #4	MIX #6
% ASPHALT (TOTAL)	3.5		0	4.5	5.0	5.5
STABILITY-lbs.	5418	5	3	5283	4953	4465
FLOW-1/100 in.	14.7	1	0	16.3	18.3	20.7
UNIT WEIGHT-lbs./cu.ft.	135.3	1	.2	137.5	138.6	139.2
LAB SP. GR. (Marshall)	2.168	2	13	2.203	2.221	2.230
MAX. SP. GR. (Rice)	2.354	2	8	2.323	2.308	2.293
% VOIDS-TOTAL MIX (VTM)	7.9		8	5.2	3.8	2.7
% SOLIDS-TOTAL MIX	92.1	9	4	94.8	96.2	97.3
% EFFECTIVE AC CONTENT	3.01	3	1	4.01	4.52	5.02
% BY VOLUME OF AC (EFF.)	6.3			8.6	9.7	10.9
% SOLIDS-AGGREGATE	86.6	8	0	86.2	86.5	86.4
% VOIDS-AGG. (VMA)	14.2	1	1	13.7	13.5	13.6
% VOIDS FILLED W/AC (VFA)	44.4	6	5	62.8	71.9	80.1

% RAP / % Virgin:	0/100
% AC In RAP:	
% AC from RAP:	0.0
% AC Absorption	0.61
% ASH:	
TSR % Retained :	80.5
Ignition Furn Calibr.:	
% AC (Optimum):	
Rice Specific Gravity:	
Lab Specific Gravity:	
Percent Air Voids:	
Percent VMA:	
Percent VFA:	
Stability:	
Flow:	
DUST/AC Ratio:	
% AC TOTAL:	
% AC from RAP:	
% AC ADDED:	

COMMENTS:
AD BAGHOUSE TO SCRG. (SHRP SPECIAL P. VEMENT STUDY 8A)

DESIGNED BY: Shane Johnson
CERT. NO. SHANE JOHNSON #0055

DESIGN LAB:
LAB CERT NO.:

APPROVAL:

TRADE SECRET

HOT MIX ASPHALT JOB MIX FORMULA

BARRUS CONSTRUCTION

DEPPE, NC

PLANT CERTIFICATION NO: B 055

TYPE MIX: BCBC, TYPE H

JOB MIX FORM NO: 97-705-021

EFFECTIVE DATE: 12-05-97

PROJECT NO: 632

COUNTY:

AGGREGATE SOURCES AND BLEND PERCENTAGES

SUPPLIER	LOCATION/SOURCE	MATERIAL	BLEND (%)
MARTIN MARIETTA	CLARKS QUARRY	#67	45.0
MARTIN MARIETTA	BELGRADE QUARRY	78M	15.0
MARTIN MARIETTA	BELGRADE QUARRY	C.SCRGS.	25.0
BARRUS CONSTR.	ANDERSON PIT	SAND	15.0
		TOTAL	100.0%

JMF COMBINED GRADATION SIEVE SIZE	% PASSING
2 "	
1 1/2"	
1 "	100
3/4"	95
1/2"	77
3/8"	
NO. 4	
8	41
16	34
40	21
80	
NO. 200	3.1

ASPHALT CEMENT %(TOT)	5.8
GRADE	PG64-22
EST ASH	
MAX. SP. GV.	2.308
LABORATORY SP. GV.	2.216
VOIDS IN TOTAL MIX %	4.0
MIN. % COMPACTION	95.0
MIX TEMPERATURE F.	300
FLOW (0.01 IN.)	10
STABILITY (LBS.)	3480
NON STRIP ADDITIVE %	0.25
MODIFIER %	0.00

ASPHALT CEMENT SUPPLIER: TRIGBULL MOREHEAD CITY
TACK COAT SUPPLIER : SPEC.S.
NON-STRIP ADD. SUPPLIER: ARR MAZ LOF-6500
MODIFIER SUPPLIER :

COMMENTS: TRADE SECRET

DATE JMF VOID:

APPROVED BY:
J.E. GRADY, JR.
PAVEMENT CONSTRUCTION ENGR.

END** REQUEST#=000103 DATE=12/05 97 TIME=14.34.01 LINES OUT=000062

BARRUS CONSTRUCTION COMPANY
APAC-CAROLINA, INC.
KINSTON, N.C.

REPORT ON MIX DESIGN OF ASPHALT MIXTURE
North Carolina Department Of Transportation

MD# _____

DATE SAMPLED:	10/28/97	DATE APPROVED:	
PROJECT NO.:	6.262328	ASPHALT: Trumbull Morehead City	PG64-22
COUNTY:	ONSLOW	ADDITIVE: ARR-MAZ LOF 65-00	(.25 %)
CONTRACTOR:	BARRUS CONST. CO.	Martin Marietta / Clarks	#67 Stone
PLANT LOC.:	DEPPE	Martin Marietta / Belgrade	78-M Stone
PLANT CERT. #:	B-065	Martin Marietta / Belgrade	Concrete Sands.
DESIGNED BY:	SHANE JOHNSON	BARRUS / ANDERSON	Natural Sand
SPECIFICATION:	H-Binder		
MARSHALL:	300 °F 4 inch 75 blows		
AC SPECIFIC GRAVITY:	1.030		

GRADATION OF MATERIALS USED

MATERIAL	#67	78M	C	CRG	SAND		Bghouse	RAP	BLEND	Spec.
PERCENT	45.0	15.0		4.0	15.0		1.0	0.0	100.0	Range
2"	100.0	100.0		100.0	100.0		100.0		100	100
1 1/2"	100.0	100.0		100.0	100.0		100.0		100	100
1"	100.0	100.0		100.0	100.0		100.0		100	100
3/4"	88.0	100.0		100.0	100.0		100.0		96	90-100
1/2"	50.0	99.0		100.0	100.0		100.0		77	70-86
3/8"	30.0	86.0		100.0	100.0		100.0		67	
#4	9.0	40.0		100.0	100.0		100.0		50	
#8	6.0	11.0		81.0	97.0		100.0		41	28-46
#16	5.0	7.0		77.0	88.0		100.0		34	18-34
#40	4.0	6.0		61.0	41.0		100.0		21	11-23
#80	3.0	3.0		11.0	4.0		100.0		5	
#200	2.0	2.0		1.7	0.7		90.0		3.1	3.0-6.0
ELUT. LOSS					0.7				0.1	0.0-4.0
AGG. B.S.G.	2.252	2.463		2.432	2.627		2.800		2.448	
								EFF. S.G.:	2.490	

FORMULATIONS

	MIX #1	MIX #2	MIX #3	MIX #4	MIX #5
% ASPHALT (TOTAL)	4.0	4.5	5.0	5.5	6.0
STABILITY-lbs.	3152	3145	3637	3285	3378
FLOW-1/100 in.	9.0	9.5	10.3	9.7	10.0
UNIT WEIGHT-lbs./cu.ft.	136.2	137.6	137.7	138.1	138.5
LAB SP. GR. (Marshall)	2.182	2.204	2.207	2.213	2.219
MAX. SP. GR. (Rice)	2.356	2.341	2.326	2.310	2.295
% VOIDS-TOTAL MIX (VTM)	7.4	5.9	5.1	4.2	3.3
% SOLIDS-TOTAL MIX	92.6	94.1	94.9	95.8	96.7
% EFFECTIVE AC CONTENT	3.34	3.84	4.34	4.85	5.35
% BY VOLUME OF AC (EFF.)	7.1	8.2	9.3	10.4	11.5
% SOLIDS-AGGREGATE	85.5	85.9	85.6	85.4	85.2
% VOIDS-AGG. (VMA)	14.5	14.1	14.4	14.6	14.8
% VOIDS FILLED W/AC (VFA)	49.0	58.2	64.6	71.2	77.7

% RAP / % Virgin:	0/100
% AC in RAP:	
% AC from RAP:	0.0
% AC Absorption:	0.69
% ASH:	
TSR % Retained :	84.6
Ignition Furn. Calibr.:	
% AC (Optimum)	
Rice Specific Gravity:	
Lab Specific Gravity	
Percent Air Voids:	
Percent VMA:	
Percent VFA:	
Stability:	
Flow:	
DUST/AC Ratio:	

COMMENTS:
ADD BAGHOUSE TO SCRG. (SHRP SPECIAL PAVEMENT STUDY 8A)

DESIGNED BY: Shane Johnson
CERT. NO. SHANE JOHNSON 0065

DESIGN LAB:
LAB CERT NO.:

APPROVAL:

% AC TOTAL:	
% AC from RAP:	
% AC ADDED.	

TRADE SECRET

HOT MIX ASPHALT JOB MIX FORMULA

BARRUS CONSTRUCTION

DEPPE, NC

PLANT CERTIFICATION NO: B -055

TYPE MIX: BCSC, TYPE I-2

JOB MIX FORM NO: 97-699-021

EFFECTIVE DATE: 12-05-97

PROJECT NO: 633

COUNTY:

AGGREGATE SOURCES AND BLEND PERCENTAGES

SUPPLIER	LOCATION/SOURCE	MATERIAL	BLEND (%)
MARTIN MARIETTA	BELGRADE QUARRY	78M	38.0
MARTIN MARIETTA	BELGRADE QUARRY	C.SCRGS.	22.0
MARTIN MARIETTA	BELGRADE PIT	A.SAND	40.0
		TOTAL	100.0%

JMF COMBINED GRADATION SIEVE SIZE	% PASSING
2 "	
1 1/2"	
1 "	
3/4"	100
1/2"	98
3/8"	95
NO. 4	77
8	60
16	
40	40
80	14
NO. 200	6.4

ASPHALT CEMENT %(TOT)	6.7
GRADE	PG64-22
EST ASH	
MAX. SP. GV.	2.350
LABORATORY SP. GV.	2.242
VOIDS IN TOTAL MIX %	4.6
MIN. % COMPACTION	95.0
MIX TEMPERATURE F.	300
FLOW (0.01 IN.)	8
STABILITY (LBS.)	2340
NON STRIP ADDITIVE %	0.25
MODIFIER %	0.00

ASPHALT CEMENT SUPPLIER: TRUMBULL MOREHEAD CITY
TACK COAT SUPPLIER : SPEC'S.
NON-STRIP ADD. SUPPLIER: ARR MAZ LOF 65-00
MODIFIER SUPPLIER :

COMMENTS: TRADE SECRET

DATE JMF VOID:

APPROVED BY:
J.E. GRADY, JR.
PAVEMENT CONSTRUCTION ENGR.

END** REQUEST#=000104 DATE=12/05/97 TIME=14.34.56 LINES OUT=000062

REVISED 4/1/97

MST FORM 001

BARRUS CONSTRUCTION COMPANY
APAC-CAROLINA, INC.
KINSTON, N.C

REPORT ON MIX DESIGN OF ASPHALT MIXTURE
North Carolina Department Of Transportation

MD# _____

DATE SAMPLED:	10/28/97	DATE APPROVED:	
PROJECT NO.:	8.262328	ASPHALT:	Trumbull Morehead City PG64-22
COUNTY:	ONSLOW	ADDITIVE:	ARR-MAZ LOF 65-00 (.25 %)
CONTRACTOR:	BARRUS CONST. CO.	Martin Marietta	Belgrade 78-M Stone
PLANT LOC.:	DEPPE	Martin Marietta	Belgrade Concrete Sorge.
PLANT CERT. #:	B-055	Martin Marietta	Belgrade Asphalt Sand
DESIGNED BY:	SHANE JOHNSON		
SPECIFICATION:	I-2		
MARSHALL:	300 °F 4 inch 75 blows		
AC SPECIFIC GRAVITY:	1.030		

GRADATION OF MATERIALS USED

MATERIAL	78M	C SCRG	A SAND			Bghouse	RAP	BLEND	Spec.
PERCENT	38.0	22.0	40.0			~~2.0~~	0.0	100.0	Range
2"	100.0	100.0	100.0			100.0		100	100
1 1/2"	100.0	100.0	100.0			100.0		100	100
1"	100.0	100.0	100.0			100.0		100	100
3/4"	100.0	100.0	100.0			100.0		100	100
1/2"	99.0	100.0	100.0			100.0		100	98-100
3/8"	88.0	100.0	100.0			100.0		96	90-100
#4	40.0	100.0	100.0			100.0		77	74-85
#8	11.0	88.0	71.0			100.0		60	60-70
#16	7.0	67.0	51.0			100.0		50	
#40	6.0	45.0	31.0			100.0		40	20-40
#80	3.0	8.0	11.0			100.0		14	12-17
#200	2.0	3.7	7.0			90.0		6.4	5.0-7.0
ELUT. LOSS									0.0-4.0
AGG. B.S.G.	2.453	2.632	2.624			2.500		2.564	
							EFF. S.G.:	2.589	

FORMULATIONS

	MIX #1	MIX #2	MIX #3	MIX #4	MIX #5		
% ASPHALT (TOTAL)	6.5	6.0	6.5	7.0	7.5	% RAP / % Virgin:	0/100
STABILITY-lbs.	2248	2363	2317	2330	1962	% AC in RAP:	
FLOW-1/100 in.	7.5	8.0	8.3	8.3	8.8	% AC from RAP:	0.0
UNIT WEIGHT-lbs./cu.ft.	137.4	138.5	139.3	140.7	141.0	% AC Absorption:	0.39
LAB SP. GR. (Marshall)	2.202	2.220	2.232	2.255	2.259	% ASH:	
MAX. SP. GR. (Rice)	2.390	2.373	2.357	2.341	2.325	TSR % Retained :	76.6
% VOIDS-TOTAL MIX (VTM)	7.9	6.4	5.3	3.7	2.6	Ignition Furn. Calibr.:	
% SOLIDS-TOTAL MIX	92.1	93.6	94.7	96.3	97.2	% AC (Optimum):	
% EFFECTIVE AC CONTENT	5.13	5.53	6.14	6.64	7.14	Rice Specific Gravity:	
% BY VOLUME OF AC (EFF.)	11.0	12.1	13.3	14.5	15.7	Lab Specific Gravity:	
% SOLIDS-AGGREGATE	81.1	81.5	81.4	81.8	81.5	Percent Air Voids:	
% VOIDS-AGG. (VMA)	18.8	18.6	18.6	18.2	18.5	Percent VMA:	
% VOIDS FILLED W/AC (VFA)	58.6	65.1	71.5	79.7	84.9	Percent VFA:	
						Stability:	
						Flow:	
						DUST/AC Ratio:	

COMMENTS:
ADD BAGHOUSE TO A. SAND

DESIGNED BY: Shane Johnson
CERT. NO. 0055 SHANE JOHNSON

DESIGN LAB:
LAB CERT NO.:

APPROVAL:

% AC TOTAL: 6.7
% AC from RAP.
% AC ADDED:

TRADE SECRET

FHWA-LTPP
ITXSL-NARO

FALLING WEIGHT DEFLECTOMETER DATA
COLLECTION AND PROCESSING SUMMARY

STATE / PROVINCE: NC / 370800
Name / Code No

FLEXIBLE PAVEMENTS

11-Dec-98

SHRP ID	SURVEY DATE mm/dd/yy	MEAN VALUES FOR DROP HT 2 (mils) S1	S1 STD DEV	S7	S7 STD DEV	TEMPERATURE (mean) D1	(min/max) D1	EFFECTIVE SN	SN STD DEV	SUBGRADE MODULUS psi	MODULUS STD DEV psi	MODULUS OF TEST PIT NO. 1	2	COMMENT NUMBER
370801	3/9/98	21 50	2 32	2 59	0 61	89	84/94	2 67	0 29	14778	2620			
370802	3/9/98	13 49	0 78	1 79	0 28	93	91/95	4 36	0 17	19959	3122			
370859	3/9/98	24 64	2 64	2 28	0 17	78	72/83	1 72	0 13	16071	1209			

COMMENTS

LTPP SPS Project Deviation Report Project Summary Sheet	State Code 37 Project Code 9809

Project Classification Information	
SPS Experiment Number: 8	State or Province: NORTH CAROLINA
LTPP Region:	☒ North Atlantic ☐ North Central ☐ Southern ☐ Western
Climate Zone:	☐ Dry-Freeze ☐ Dry-No Freeze ☐ Wet-Freeze ☒ Wet-No Freeze
Subgrade Classification:	☒ Fine Grain ☐ Coarse Grain ☐ Active (SPS-8 Only)
Project Experiment Classification Designation (SPS 1, 2 and 8):	3_4
Construction Start Date: 97-10-09	Construction End Date: 97-12-15

Deviation Summary	
Site Location Deviations:	☒ No Deviations ☐ Minor Deviations ☐ Significant Deviations
Construction Deviations:	☐ No Deviations ☒ Minor Deviations ☐ Significant Deviations

Data Collection and Processing Status Summary	
Inventory Data (SPS 5,6,7,9):	☐ Complete Submission ☐ Incomplete ☐ Data Not Available ☐ NA
Materials Data:	☐ All Scheduled Samples Obtained and Tested ☒ Incomplete/No Test Data
Construction Data:	☒ All Required Data Obtained ☐ Incomplete/Missing Data Elements
Historical Traffic Data:	☐ All Required Historical Estimates Submitted (SPS 5,6,7,9) ☐ Required Estimates Not Submitted ☒ NA
Traffic Monitoring Equipment:	☐ WIM Installed On-Site ☐ AVC Installed On-Site ☐ ATR Installed On-Site ☒ No Equipment Installed
Traffic Monitoring:	☐ Preferred ☐ Continuous ☐ Minimum ☒ Below Minimum ☐ Site Related
Traffic Monitoring Data:	☐ Monitoring Data Submitted ☒ No Monitoring Data Submitted
FWD Measurements:	☐ Preconstruction Tests Performed ☒ Construction Tests Performed ☒ Post-construction Tests Performed
Profile Measurements:	☐ Preconstruction Tests Performed ☒ Post-construction Tests Performed
Distress Measurements:	☐ Preconstruction Tests Performed ☒ Post-construction Tests Performed
Maint. & Rehab. Data:	☐ Complete Submission ☐ Incomplete ☐ Data Not Available ☒ NA

Report Status	
Materials Sampling and Test Plan:	☐ Document Prepared ☒ Final Submitted to FHWA
Construction Report:	☐ Document Prepared ☒ Final Submitted to FHWA
AWS: (SPS 1, 2, & 8)	☐ AWS Installed ☒ AWS Installation Report Submitted to FHWA ☐ NA

Page 1 of 5 Preparer Basel Abukhater - NARO Date 98-12-17

LTPP SPS Project Deviation Report Site Location Guidelines Deviations	State Code 37 Project Code 0800

☒ Comments Pertain to All Test Sections on Project
☐ Comments Pertain Only to Section(s): (Specify) _____

Site Location Guideline Deviation Comments

No Deviations.

Page 2 of 5 Preparer Basel Abukhater - NARO Date 98-12-17

LTPP SPS Project Deviation Report Construction Guidelines Deviations	State Code 37 Project Code 0800

☒ Comments Pertain to All Test Sections on Project
☐ Comments Pertain Only to Section(s): (Specify) _____

Construction Guidelines Deviation Comments

1- The finished elevations of the DGAB layer did not meet the 12 mm tolerance in all the sections. Section 370801 had an extra 18 mm, 370802 was shy by 14 mm, and 370859 had an extra 21 mm of DGAB, as measured by the rod and level.

2- No prime coat was used on the DGAB layer before paving. NC DOT wanted to avoid local cars, trucks, and paver wheels picking up stone due to sticking of asphalt emulsion, which usually causes tracking of the material into nearby homes and disruption to the fine grade of the DGAB layer.

3- The lane width was 3.05m, which is the minimum allowed, as compared to a standard 3.66 m preferred lane width. The shoulder width is 0.61 m which is less than the minimum 1.22 m specified in the SPS-8 Construction Guidelines.

 Preparer Basel Abukhater- NARO Date 98-12-17

LTPP SPS Project Deviation Report Data Collection and Materials Sampling and Testing Deviations	State Code 37 Project Code 9800

☒ Comments Pertain to All Test Sections on Project
☐ Comments Pertain Only to Section(s): (Specify) _____

Data Collection & Material Sampling and Testing Deviation Comments

1- A California type Profilograph test was not performed on the test sections as is required by the guidelines. Only the LTPP Profilometer™ was used to measure the profile.

Page 4 of 5 Preparer Basel Abukhater - NARO Date 98-12-17

LTPP SPS Project Deviation Report Other Deviations	State Code 37 Project Code 0800

☒ Comments Pertain to All Test Sections on Project
☐ Comments Pertain Only to Section(s): (Specify) _____

Other Deviation Comments

No Other Deviations.

Page 5 of 5 Preparer Basel Abukhater - NARO Date 98-12-17

APPENDIX B

Photographs

Figure B-1. Subgrade Preparation at the SPS-8 Site on SR 1245

Figure B-2. FWD Testing at the SPS-8 Site on SR 1245 North Bound

Figure B-3. Split Spoon Sample from the SPS-8 Site at SR 1245 North Bound Lane

Figure B-4. Shoulder Auger Probe at the SPS-8 Site on SR 1245 North Bound

Figure B-5. Spreading Dense Graded Aggregate Base (DGAB) Material

Figure B-6. Collecting Bulk and Moisture Samples from the DGAB Layer

Figure B-7. APAC Deppe Asphalt Batch Plant at Deppe, North Carolina

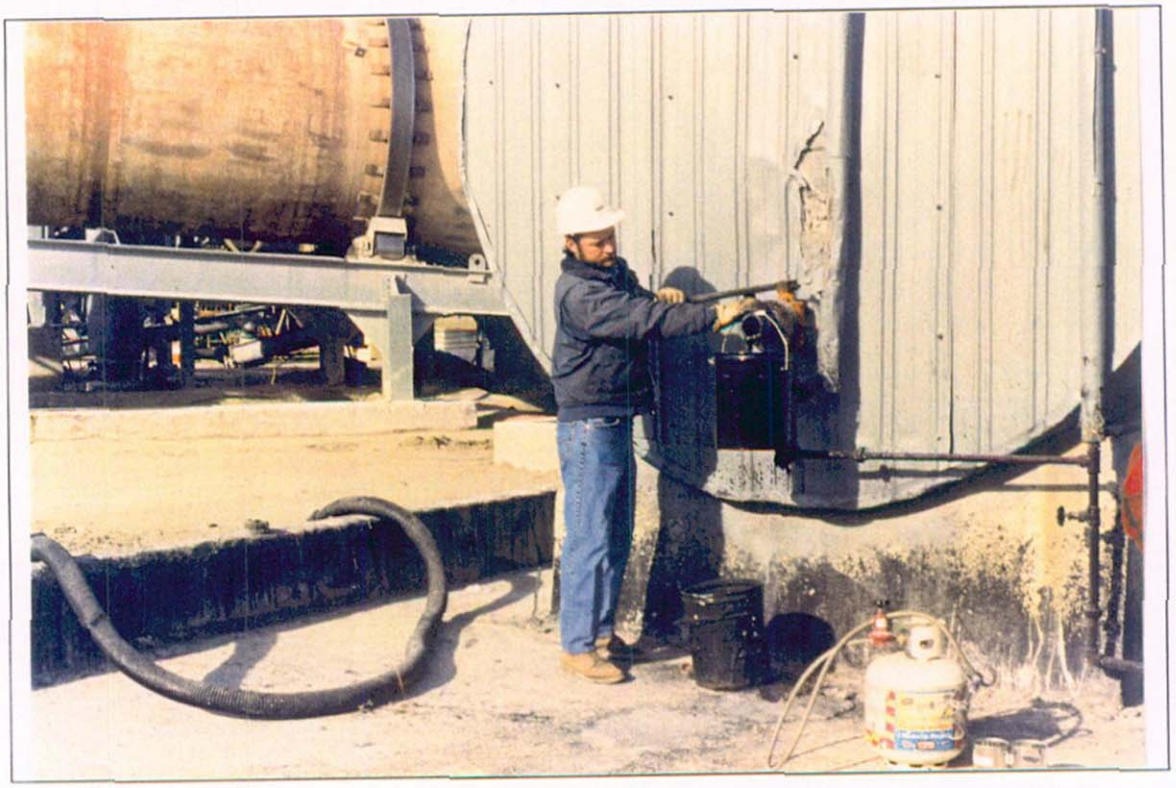


Figure B-8. Collecting Bulk Liquid Asphalt Cement from the Plant

Figure B-9. Collecting Bulk Combined Aggregate Sample from the Belt at the Plant

Figure B-10. Collecting Bulk Combined Aggregate Sample for MRL from the Plant

Figure B-11. Paving HMAC at the SPS-8 Site on SR 1245 North Bound Lane

Figure B-12. Two Rollers Compacting the HMAC at the SPS-8 Site on SR 1245

Figure B-13. Collecting Hot Mix Bulk Samples from the Paver Hopper

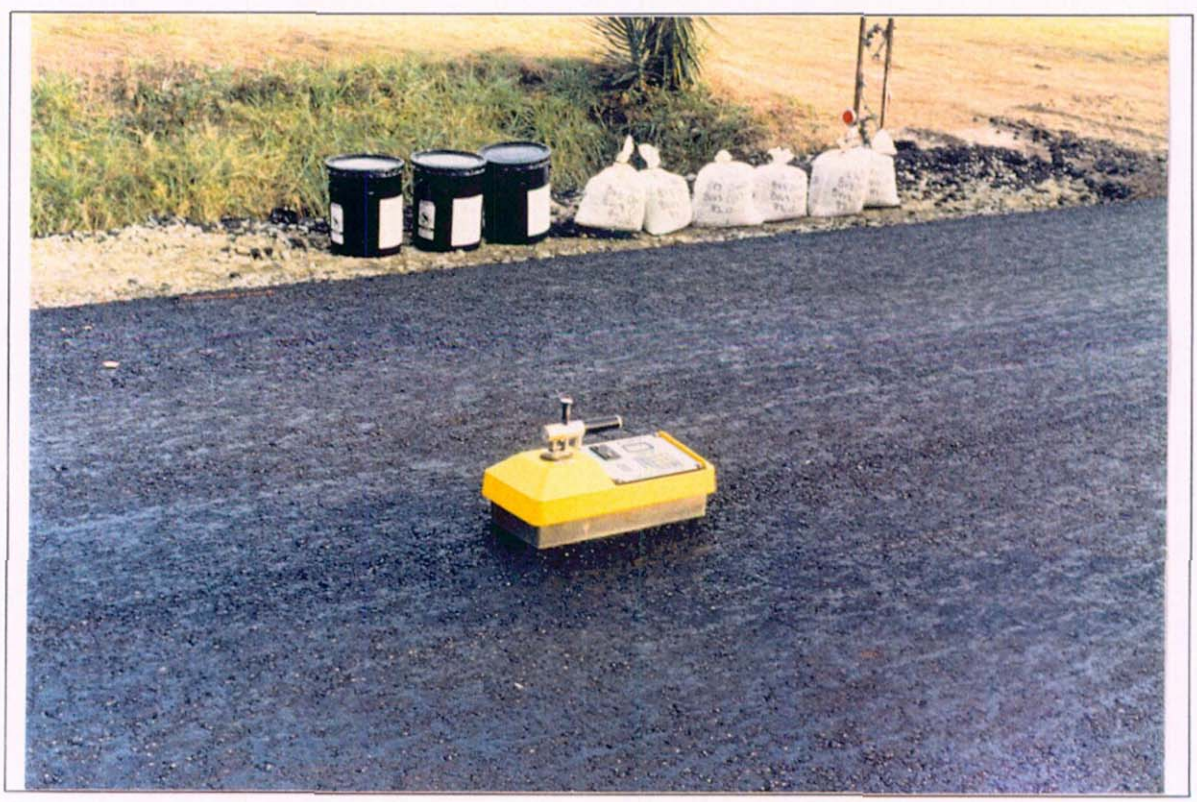


Figure B-14. Nuclear Gauge Measurement on the HMAC, showing Bulk Samples

Figure B-15. Coring 102 mm Cores from Section 370801 in the 0- Sampling Area

Figure B-16. 24 102 mm Cores Collected from the 3 SPS-8 Sections on SR 1245

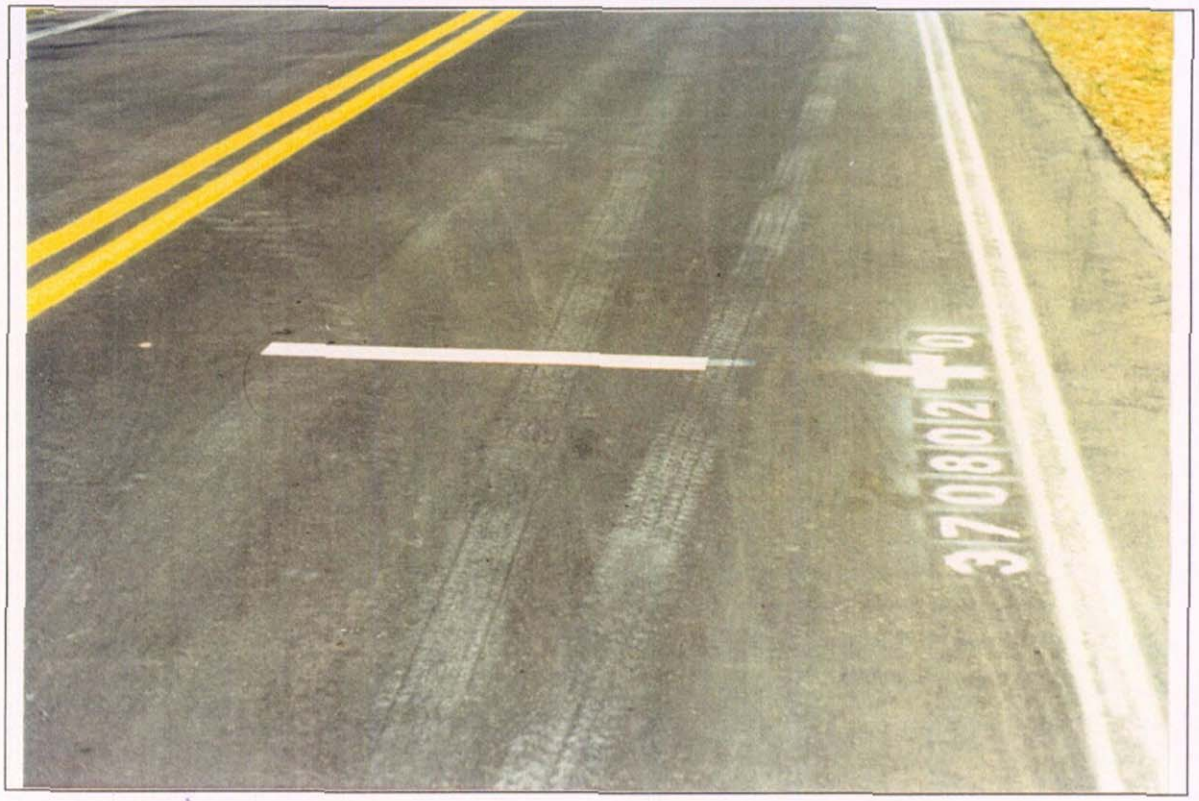


Figure B-17. Pavement Markings on Section 370802 Showing Starting Stripe

Figure B-18. Identification Sign at the Beginning of Section 370801 Station 0-100

Figure B-19. Installing the Automated Weather Station (AWS) North of the SPS-8 Site

Figure B-20. Installing the Automated Weather Station (AWS) Close to the Cul-De-Sac